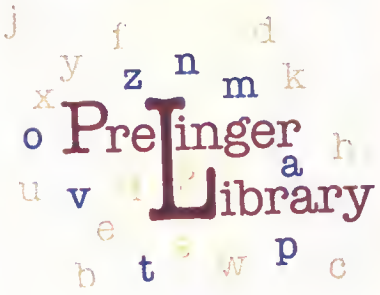
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January - February
1952

California Highways and Public Works

Official Journal of the Division of Highways, Department of Public Works, State of California

FRANK B. DURKEE, *Director*
GEORGE T. McCOY, *State Highway Engineer*
KENNETH C. ADAMS, *Editor*
HELEN HALSTED, *Associate Editor*

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Epic Battle

Snow Removal Crews Wage Long Fight Against Record Storm

By N. R. BANGERT, Assistant Maintenance Engineer

THE GREATEST snowstorm in more than 50 years swept into Northern California on Thursday, January 10th, eventually bringing to a halt all transcontinental traffic on highways and railroads. Howling winds sweeping at velocities of 75 to 100 miles per hour drove freshly fallen snow into mountainous drifts, isolated many mountain communities for days, and set the stage for many courageous and dramatic rescue efforts, many of which probably remain unrecorded.

Storms during the month of December packed more than their normal punch through the Sierra Range between Bishop and the Feather River and several of the trans-Sierra routes, normally open to winter traffic, were closed for periods of a few hours to several days by blizzards and snowslides. During the latter part of the month, strong winds deposited great depths of snow on the steep east slopes. These deposits gave way without warning and swept across the highways.



The suddenness of the snowstorm trapped these trucks at Boxter on U. S. 40 on January 11th. Photo by San Francisco Chronicle.

One such avalanche, near the lower end of the Meyers Grade on U. S. 50, buried three maintenance men from the Echo Summit Station. One man, James S. Swafford, died before rescue workers were able to dig through the 10 feet of packed snow left on the road. Another avalanche, further down the grade, engulfed an unoccupied heavy push plow truck and carried it 300 feet down the slope.

Second Storm

Crews were barely getting roads in the mountain areas back to normal winter condition when the big January storm began to brew. This storm was preceded in the Sacramento Valley by several days of rain. On the east side of the Sierra, a preview of the storm to come took the form of high winds which swept the snow fields traversed by U. S. 395 on January 10th, and required the closing of this route until visibility improved. U. S. 50 was closed

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east of the summit the night of January 10th as a precautionary measure since a new fall of snow threatened to precipitate fresh avalanches down the steep slopes above the Meyers Grade. U. S. 40, the main trans-mountain artery between San Francisco and Salt Lake City and the most popular truck route through the Sierra, remained open until 1.40 p.m., Friday, January 11th. Strong winds predicted for that day also materialized during the afternoon hours and made travel along the ridge near Airport slow and hazardous for traffic attempting to reach lower elevations.

Other Routes Closed

Eastbound traffic shut off by the closure of U. S. 40 and U. S. 50 sought passage over the more northern routes, such as the Feather River road, State Sign Route 24, and the Red Bluff-Susanville lateral, State Sign Route 36. These roads gave some relief during the early stages of the storm but finally closed on Sunday, January 13th, the first due to high winds and the latter because of drifts and traffic tieups.

U. S. 395, which skirts the eastern fringe of the Sierra, was closed by high winds on January 14th for three days and again on January 20th for an eight-day period.

As the area affected by the storm was so great and the road closures so complete, the first efforts of highway crews were directed to bringing relief to as many snowbound communities as possible in the shortest time with the equipment available. The opening of main roads for transcontinental traffic became secondary in importance.

Job for Communicotions

The severity of the storm was well-appreciated by Headquarters Office, as field conditions were forthcoming to that focal point by radio and teletype, day and night. The staff of the communications office at Sacramento, as well as informants in the district offices and at the superintendents' headquarters in the affected areas, worked "around the clock" for many days, gathering information on local conditions and relaying instructions concerning the deployment of men and equipment. The wisdom of expanding radio installations to include key equipment in virtually every foreman's territory was strongly confirmed during this storm.

As equipment on the high mountain roads became immobilized by breakdown or impassable drifts and as snow depths mounted in the foothill areas, the need for equipment capable of opening long sections of closed road became sharply apparent. Fortunately, at Headquarters Shop in Sacramento six new auger type rotary plows were awaiting assembly. An equal number were on hand at the North Hollywood Shop in Southern California. These new units had been obtained to replace worn-out and over-age equipment.

I. N. S. SENDS THANKS

Sacramento
January 28, 1952

MR. FRANK B. DURKEE
Director of Public Works
Sacramento

DEAR MR. DURKEE: As a veteran member of the press, and an employee of International News Service, I do wish sincerely to pay this tribute to you and your department and all its employees for their cooperation during the recent bitter high Sierra storms.

Especially, I am grateful for your prompt responses when the Southern Pacific streamliner City of San Francisco was snowbound in the mountains.

Had it not been for your very efficient communications system headed by your keen and alert Arnold H. Carver—coupled with the excellent work of Public Information Editor Kenneth C. Adams, we all would have been caught short.

It's a long serious story, but in a few words with which a newspaperman can express his deep appreciation of your operation, let me say: "You did a swell job—and a million thanks."

Best personal regards to you and your staff.

Sincerely,

A. NEIL SHAW
Bureau Manager
Room 224, State Capitol
Sacramento, California

Reinforcements Rushed

At the first request for additional equipment, the equipment department threw its entire resources into the battle of plow assembly. Mechanics and shop foremen worked 16 to 20 hours a day to get the units out. The first of the six plows at Sacramento left the shop about 2 a.m. Monday, January 14th, the last on Friday, January 18th.

This equipment went into the field without the customary "shakedown" run and many of the "bugs" which developed during the first few days of operation under extreme conditions would normally have been discovered and corrected before the machines left the shop. The first auger plow from the southern shop was driven to Sacramento in an overnight drive, and immediately was sent on to the Truckee area by way of the Feather River road.

The shop men who delivered equipment into mountain areas often found it necessary to plow a road to their destination. Others, upon becoming snowbound, joined the regular crews in the "round-the-clock" operation of clearing slides and drifts. Mechanics at mountain stations spent countless hours at the grueling task of keeping the big machines rolling. Radio communication played a vital part in speeding the ordering of parts when breakdowns occurred.

Red Bluff-Susanville-Reno Lateral

State Sign Route 36 received some of the heaviest snowfall in its history, especially between Morgan Summit and Fredonyer Summit. During the first week of the storm, 80 mile an hour winds raged at times through this mountain area. A snow depth of 18 feet was recorded on the Morgan Summit gauge on January 22. Chester received a snowfall of about nine feet. Two heavy bulldozers working side by side were required to open the road between Chester and Susanville. This route received a second jolt on Friday, January 18th, when gale winds began to rage along the east slope of the mountains between Susanville and Reno. Fourteen-foot drifts piled over the road near Milford. Heavy tractor equipment was pressed into service to break the drifts and traffic was convoyed through the restricted portions between Susanville and the Nevada state line for a two-day period beginning Wednesday, January 23.



UPPER—Stalled City of San Francisca and (BELOW) rescue road to train cut through by Division af Highways maintenance crew after many grueling haurs of labor.

Feather River Route

Snow fell on State Sign Route 24 almost to the city limits of Oroville during the height of the storm. Rock slides in the lower Feather River Canyon and snow slides east of Rich Bar hampered the movement of traffic attempting to bypass the closures on U. S. 40 and U. S. 50. Snow fell to a depth of over two feet at Jarboe Gap, five feet at Quincy and seven feet at Spring Garden Summit. Extremely high winds buffeted the area from Blairsden to Hallelujah Junction and at times reduced visibility to zero. Mountainous drifts covered the road through the Sierra Valley between Portola and Chilcoot Pass. Snowplow units were



Plow clears path through deep drift on U S. 50

slowed or stalled by the excessive drifts and bulldozers were used on several occasions to break the road open. Portions of this road opened at intervals to restricted local traffic, and the entire route was declared open to all traffic on January 29th. During the height of the storm, three bulldozers were used to supplement plow equipment on State Route 83 between the Feather River Road and Greenville.

Grass Valley-Downieville Area

The Yuba Pass Road, State Sign Route 49, through Downieville and Sierra City, was closed early in the storm by rock slides and heavy snowfall. State Sign Route 20 east of Nevada City also closed due to snowfall and drifting. Records show the following maximum snow pack figures: Nevada City 26 inches, Downieville 72 inches and Sierra City 96 inches.

A rotary plow was brought north from the Stockton District to reopen the road towards the lumber town of Washington, 18 miles east of Nevada City. Going on this road was tough as snow depths up to eight feet were encountered, and eight days were required to plow to a point which could be reached by bulldozers working from the town. Rock slides hampered the efforts of a rotary brought in from U. S. 40 to open State Sign Route 24 through Downieville to Sierra City. An opening to the latter city, at many places through nine-foot drifts, was made by January 24th.

THANKS FROM UNITED PRESS

THE UNITED PRESS ASSOCIATIONS
SACRAMENTO

Mr. Frank Durkee
Director of Public Works
Sacramento, California

My Dear Mr. Durkee: We should like to express our appreciation for the cooperation afforded by your department in aiding us in our coverage of the stalled southern Pacific streamliner.

Our thanks go particularly to your communications office headed by Mr. Arnold Carver and to Mr. Ken Adams.

Sincerely,

Walter L. Barkdull
Acting Manager

Far North

U. S. 299—Redding to Alturas—also received its share of snow and wind, with closures occurring at Big Valley Mountain and at Adin Mountain. Wind-drifted snow partly filled the upper end of Howard Gulch on the Canby-Tulelake Highway, and bulldozer operation was required to open the route. Heavy drifting also occurred on that portion of U. S. 395 between Johnsonville and New Pine Creek, especially north of Secret Valley and on Sage Hen Summit near Likely. The McCloud-Burney connection and the Mt. Lassen recreational stub likewise suffered the effects of high winds. Travel on U. S. 99 north into Oregon, by comparison, was not severely affected, as blizzard conditions and periods of heavy snowfall were of relatively short duration.

U. S. 395

The portion of U. S. 395 in Mono County north of Bishop suffered heavily from high winds for a two-weeks' period beginning January 14th. A wet snow condition, uncommon to the area, formed an extremely hard pack, and heavy tractor equipment, special snow units under test by the Navy at Crestview, and explosives were marshaled to break 10- to 15-foot drifts. Maximum snow readings for several of the stations follow: McGee Creek 52 inches, Crestview 72 inches, Conway Summit 54 inches, Sonora Junction 40 inches.

North Shore Area

Snowfall of almost unprecedented proportions, accompanied at times by high winds, blanketed the area at the north end of Lake Tahoe. A pack in excess of seven feet developed in some areas. As roads radiating south and east of Tahoe City became impassable to even the heaviest snow trucks, efforts were concentrated on keeping open a life line along the Truckee River between Tahoe City and Truckee. This life line was broken many times by snowslides which developed on the east slope of the canyon, particularly in the vicinity of Deer Park. Swift moving avalanches overran the road in several places to depths of 17 feet and formed solid barriers, against which rotary plows made agonizingly slow progress.

Equipment breakdowns at points far from replacement centers slowed the efforts in this area. Efforts to cut emergency roads through to Brockway and to Homewood and Meeks Bay were frequently hampered by the necessity of returning equipment to new closures along the Truckee River. Aided by equipment brought in from the Sacramento side via northern routes, crews completed an emergency road to Brockway on January 30th. A similar road was pushed as far south as Bliss Park on the west side by February 3d.

U. S. 40

Under average winter conditions, sufficient plow equipment is assigned to U. S. 40 to handle the notoriously heavy falls of snow expected in the Donner Summit area. The storm which broke into full fury January 11th was not, however, an average storm and, as drifting and low visibility prevailed on all roads in the mountain area, equipment could not be spared from the side roads. Although assigned equipment on U. S. 40 remained in operation until broken beyond immediate repair or overwhelmed in impassable drifts, there came a time during the first weekend when virtually all efforts ground to a stop. Isolated crews concentrated on the digging out or repair of equipment and attempted to maintain contact with local sources of supply.

The stalling of the crack streamliner of the Southern Pacific near the Yuba Gap Maintenance Station spurred the road crew at that station to superhuman effort to break open the road which permitted the eventual rescue, without mishap, of all passengers and train crew. The story of this dramatic action is recounted elsewhere



This was a typical drift condition that prevailed on U. S. 40 at Donner Summit

CLEARING OF SIERRA ROADS WAS HERCULEAN TASK

Motor vehicles are proceeding over the Sierra on Highways 40 and 50 for the first time in nearly a month. Back of this announcement is the story of as hectic a battle as man ever waged against the elements in the West.

The roads went under early in January when the clouds dropped eight feet of snow on the Sierra in less than a week. As though that were not enough, the storm king threw some 100 miles an hour gales at the highway crews, making the task of clearing the highways an impossibility.

Thirty-foot drifts—almost as high as a three-story building—clogged the rights of way and the temptation must have been strong to let the thing lie until spring.

However, working around the clock, ofttimes in blizzards and always under the threat of snow and land slides, the crews finally carved passageways through the drifts to restore the traffic on these vital highway arteries.

It was a Herculean task when all the adverse factors are considered. The highway department, from State Highway Engineer G. T. McCoy down to the men with the shovels, deserves a lot of credit for its dogged efforts.

Only in that way was victory achieved on the Victory and Lincoln Highways.

—*Sacramento Bee*

On Saturday night, February 2d, this huge boulder weighing approximately 4,000 tons, blocked U S. 50 one mile and a half east of Kyburz



in this issue of *California Highways and Public Works.*

Drifts 10 Feet Deep

Even before the gale subsided, crews from the Colfax Station manned additional plows and began to open a narrow path uphill from Baxters toward Airport where drifts up to 20 feet in depth covered the road. Two rotary plows, working from the west, met "Old Faithful"—the lone survivor from Yuba Gap—as it "holed through" the biggest drift at Airport at 10 a.m., Thursday, January 17th.

Aided by clearing weather, and repaired equipment from Donner Station, reopening of the remaining 16 miles between the train rescue point and Donner Summit went rapidly. An emergency road sufficient to permit the bringing in of food and fuel supplies was established by Friday, January 18th. Unrestricted traffic was permitted as far as Donner Summit by Sunday, January 27th.

Work was immediately started on the opening of the road down the steep east slope. The progress was slow as the summit cut had drifted with snow to a depth of 16 to 20 feet.

Explosives Required

At first, large hand saws were used to cut through the upper portion of the drift to permit more rapid undercutting and disposal of the snow face by the rotary plows. Later, as the drifts consolidated, explosives were required to fracture and dislodge the snow. Progress through some of the deeply drifted cuts was very slow, less than 300 feet being made at times in 24 hours of operation. Similar operations were started at the lower end of Donner Grade as soon as plows could be released elsewhere from the task of driving roads to snow-bound communities. Snow depths of 40 feet were encountered in some spots and much of the work was undertaken under the threat of sudden engulfment by snowslides. A narrow service road was punched through by 6 a.m. February 5th, but much widening of the roadway, back sloping of the icy slopes, and shooting down of overhang was required before the road could be opened to traffic Friday, February 8th.

At one time during the blizzard, all roads out of Truckee were closed and in order to re-establish contact with the east, it was necessary to use large bulldozers to move mountainous drifts for several miles east of the town and to recut a trench to the state line. Snow pack in the Truckee area was exceptionally heavy, an estimated 10 feet being reported at one time.

Snow Depths

Listed below are a few of the recorded snow depths at Norden for December and January:

December 25, 1951	57 inches
January 1, 1952	121 inches
January 10, 1952	118 inches
January 17, 1952	218 inches

During the period January 10th to January 17th a snowfall of 138 inches was recorded.

U. S. 50

The storm dealt a somewhat different type of misery to the snow crews at Echo Summit and at Placerville on U. S. 50. Heavy wet snow accumulated to great depths on the canyon slopes west of the summit and began to slide across the road at a number of points. A bus load of students trapped by the rapid fall of snow on Friday night, January 11th, took shelter at the Echo Summit Maintenance Station. Several families from Audrain, Phillips and Echo Chalet also sought refuge at the Maintenance Station. Snowslides between Kyburz and Echo Summit prevented departure of the bus until Thursday, January 17th.

At Twin Bridges, on Monday, January 14th, a snowslide partly destroyed the store and resort building, killing two occupants of the structure. Highway radios played a prominent part in the rescue operations, as the Echo Summit foreman was able to summon a rotary plow to assist in digging to the crushed building and in enlisting all possible aid from Strawberry Lodge, to the west.

Saved by Radio

Radio communication was also largely responsible for the speedy rescue of the three men trapped under 10 feet of snow on lower Meyers Grade on the morning of December 30, 1951. As the crews were changing shift at that hour, one of the men going off shift was in the process of turning a radio-equipped express around while two other operators approached nearby on foot. As the slide struck, the men on foot were whisked to the side of the snow trench and the express was turned over on its side and buried under five feet of snow. During the first few moments that followed, the operator in the express heard his foreman at Echo Summit giving the road and weather report to Placerville. Chancing that he might be heard, he fumbled in the dark for the microphone and called the summit. The foreman answered immediately and rushed all available men in camp as well as men from nearby utility service crews to the rescue. The operator in the express was able to dig his way to the surface. The men who had been on foot were buried 1¼ hours; one was revived but the other failed to respond although artificial respiration was applied for 1½ hours.

A maximum snow pack of 170 inches was recorded at Echo Summit on January 26th.

A small resident crew stationed temporarily at Tahoe Valley worked doggedly through deep drifts to keep that portion of U. S. 50 open until heavy rotary equipment could be brought in through Nevada. Such equipment was sent from Yuba Gap, via Quincy and Carson City, as soon as Spooner Summit west of the latter city was opened on January 28th.

Breaking of the last barrier, the deep snowslides on Meyers Grade, permitted the opening of the entire route to through traffic on Saturday, February 9th.

At the south fringe of the storm, road crews on highways leading to the ski areas east of Stockton were likewise embroiled in a snow battle unequalled for many years.

The effort expended by maintenance crews, shop personnel, and other service units during such a storm cannot be fully comprehended or appreciated. The magnitude of the operation, however, can in some measure be realized by comparing the snow removal cost figures in the following table:

January Snow Removal Expenditure

	1950-51	1951-52
District II	$87,238	$298,279
District III	76,248	193,075
District IX	18,843	74,264
District X	13,815	39,968
	$196,144	$605,586



San Francisco Chronicle

THE CITY'S ONLY HOME-OWNED NEWSPAPER

Founded by M. H. de Young, Publisher 1865 to 1925

GEORGE T CAMERON, Publisher PAUL C. SMITH, Editor

EDITORIAL PAGE

The Blizzards Breed 'Em Tough

The Sierra train rescue called public attention to the mountain men who work along Route 40, fighting snow to keep the highways, rails, power lines and telephone circuits open. These particular maintenance crews of the Highway Division, the Southern Pacific and the Pacific Gas and Electric and the Telephone Company deserve all the praise and thanks they're getting from the City of San Francisco's passengers and the general public, but while the iron is hot we'd like to strike it for a mention of all the numerous mountain fraternity up and down the range.

On every Sierra road, from early fall till late spring, highway maintenance crews have snowdrifts to fight, power and phone company "cruisers" have their poles and lines to tend, and the millions down in the (occasionally) sunny lowlands never give them a thought. Skiers, perhaps, are the exception. The familiar week-end road-condition notice, "Chains advised on Route 108," usually means that on Friday a team of highway maintenance men has sweated a snowplow up the grade to make way for the Saturday sedans full of skiers. And, likely as not, the highway crew's Sunday dinner will be interrupted by a call to go to the rescue of a stranded party of big-city snow bunnies.

The blizzards breed 'em tough, and life above the snow line is hazardous. When a mountain man's pickup truck stalls, or his weasel or Sno-cat breaks down, he is thrown back onto his own hind legs, so to speak; back where the '49ers were, or the Indians before them, in a man-against-nature conflict.

A letter in the Forum from Vida M. Jones of Menlo Park suggesting that the first day of spring be set aside to honor these "valiant crews" is not the least appropriate idea we've heard expressed during this week of the Big Storm.

MAN vs. SNOW

By ART HOPPE
San Francisco Chronicle

The month is October.

Out in the North Pacific, air currents swirl and dance. They grow and swell and a storm is born—the first of the season.

Slowly the titanic forces begin to move. Ponderously they roll south.

In the State Highway Maintenance Station at Yuba Gap, 14 miles west of Donner Summit, the air still holds the warmth of late summer. The black asphalt of United States Highway 40 outside the door is warm to the touch—heated by the sun and the thousands of whirring automobile tires.

Inside the maintenance station, all is quiet. The beds in the dormitory are empty and the cribbage boards lie idle. The summer's work of oiling and patching the road is over. The winter's work has not yet begun.

The 14-foot red steel snow stakes have been spaced along the highway to guide the snowplows when the drifts get high. And in the "barn" next door to the station, the huge rotary snowplows stand ready—their augers sharp, their fans well-oiled.

The big dump trucks have been fitted with their concave, 10-foot blades in front, and their beds are filled with sand and gravel to give weight to their rear wheels in the snow.

The men are in their homes in Colfax and Auburn, Dutch Flat and Alta—having a Sunday with their families.

In the maintenance station, Pat Patchel, the cook, reads in his room.

"A new storm is bearing down on Northern California," says the slightly-bored voice of the radio announcer. "* * * possibility of snow in the high Sierra * * *."

Patchell sighs, gets to his feet and cranks the bell on the partyline telephone.

In homes in Colfax and Auburn, Dutch Flat and Alta, the phones begin to ring.

By nightfall, the men are back on the station, cursing good-humoredly. The sky now has darkened and gusts whip through the evergreens and stir the deep bed of pine needles that covers the Sierra. The first few flakes of the new winter flutter down, melting at first, but building up slowly—billions upon billions.

By early evening, the white line in the middle of the highway has disappeared and the two big push plows roll out of the barn. Just behind the push plows, Foreman Jack Snider dispatches his motor grader. Its narrow 12-foot blade bears down on the pavement with the full weight of the high-cabbed truck behind it and it can scrape the asphalt bare.

Yuba Gap's two big rotaries are kept in reserve in the barn. They are of no use until the snow gets deeper.

By morning, the skirmish is won. The highway is clear except for a jumbled three-foot pile on either side, pushed there by the diagonal blades on the plows. The snow has stopped falling.

"Better get the rotaries working on the pile," Snider radios the barn from his pickup truck in which he is patrolling the road. We'll need that space for the push plows if another storm hits."

The rotaries roll up the road, chewing away at the accumulation on the sides, spewing it far from the road.

On their fronts is a six by eight-foot opening like a shallow upright box. Inside the box three rows of augers, meat-grinder-like, send the snow into a two-foot hole in the middle of the box. There it is picked up by a whirling fan and shot out in a 100-foot plume through a funnel above and behind the augers.

When one has passed, the jumbled banks are neat and square as though some huge hand had sliced them with a knife.

"1162," comes the voice of the dispatcher at Yuba Gap to Snider over the Highway Department's modern FM radio system. "1162. He's got a broken short axle. Just this side of Tin Barn."

Snider swears softly. This is the headache. Breakdowns. Not so much now, but later in the year when the plows are working night and day * * *.

The month is January. January 10th—a Thursday.

The forecaster is talking about a new storm. But Highway 40, closed for four days over the New Year's holiday, is in good shape. The road has

LETTER OF APPRECIATION

Mr. Frank B. Durkee
Director of Public Works
Sacramento, California

Dear Mr. Durkee: Now that the snow is cleared out of my hair—even though it might still be in yours—I would like to take this opportunity to thank your staff and road crews for their courtesy and intelligent cooperation during our coverage of the snowbound streamliner, City of San Francisco.

You have a grand gang and you can be proud of the job they are doing. I know you expect your men in the field to be up all night but I think you should know how many times I aroused Ken Adams to get a little bit more information. He was always more than willing.

Please feel free to call upon me for any help I might be able to give you.

Sincerely,

Abe Mellinkoff
City Editor
San Francisco *Chronicle*

PRAISE FOR SNOW CREWS

Mr. Jack Snider
Yuba Gap Highway Maintenance Station
Yuba Gap, California

Dear Mr. Snider: I know Art Hoppe and Ken McLaughlin have told you how much the *Chronicle* appreciated your unstinting cooperation during their coverage of the City of San Francisco. I have written Sacramento telling them what I think, but I would be remiss if I didn't send a personal word to you and your gang.

Your job in the snow has been—I hope—well recorded in this paper but I want to add a word of warm appreciation for your cooperation with our guys on the story.

Sincerely,

Abe Mellinkoff
City Editor
San Francisco *Chronicle*

been widened out to maximum by the rotaries and there seems to be plenty of room for the push plows to shove aside any new snowfall.

There have been only five days since November 13 when it hasn't snowed. The pack along the road is six feet deep.

It begins to snow again in the morning and the push plows roll. By mid-afternoon the rotaries are out again. Shifts are changed at midnight. The men will work until noon the next day, eating sandwiches in the cabs of their equipment.

A howling wind sweeps across the mountains and into the canyons, carrying the snow before it. Visibility is cut to nothing.

At 1.20 p.m. Friday, Snider orders the road closed. He still has a narrow, two-way road, but the parking lots are filled with snow, and only emergency traffic can be allowed through.

The California Highway Patrol sets up a road block at Colfax and the cops are tough on motorists with excuses. They know from experience that some skiers will swear to anything—starving relatives, doctor needed—in order to get to resorts.

Then, finding no parking spaces off the road, they leave their cars on the highway and the snowplows can't get through.

Saturday—Still snowing; road still open to emergency traffic. A falling tree crashes through the windshield of one of Snider's two rotaries, putting it out of commission for a precious 90 minutes.

Snider orders it lubricated while being repaired. Lubricate all equipment every 48 hours. His other rotary is having trouble with its fuel pump, but it keeps going.

Both rotaries are having trouble with fallen trees and rocks that have slid down and been buried in the drifts. When the augurs on a rotary hit a rock, a small shearing pin breaks to save the heavier machinery and the crew must get out into the gale, take off their gloves and put in a new pin with their blue hands. Three times in an hour * * * ten times * * *.

Down in Marysville, R. I. (Nick) Nicholson, boss of snow removal on Highways 40, 50 and State Route 24, is generaling his forces by radio.

Brand New Rotary

A brand new rotary is almost ready to go from the State's garage in Sacramento. "All it needs now is a coat of paint," he is told.

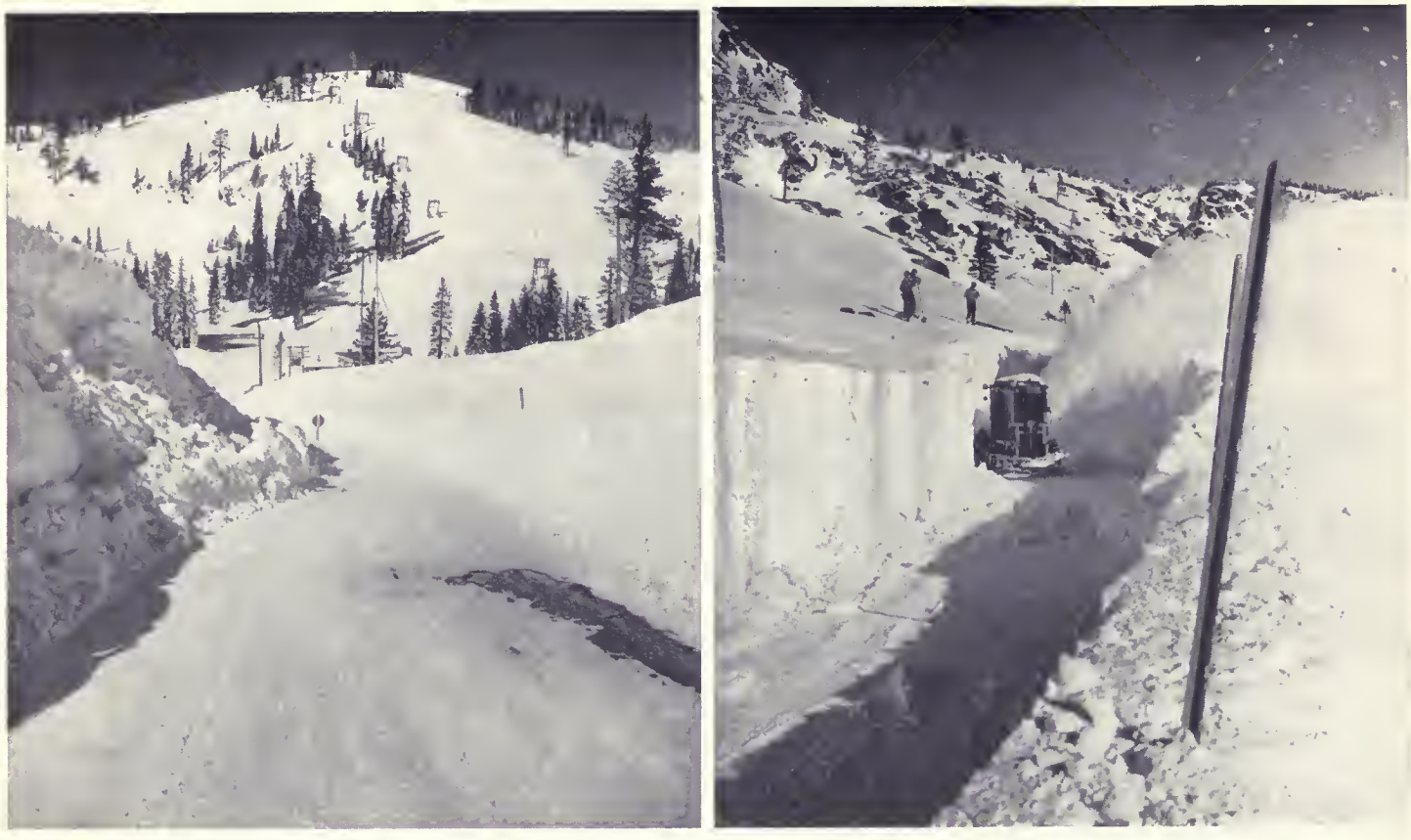
"You can forget the paint," Nicholson tells the radio. "Get it up to Snider as is."

Sunday—The snow is heavier. Five feet have fallen in the past three days. Snider is losing ground—even with the third rotary. He only has a one-way road open now. But the storm lets up in the afternoon and by late Sunday night, the road is again two-way, though narrow, in most stretches.

Monday—A new storm strikes. This one is a blizzard with 100-mile-per-hour winds. The drifts are soon over



Plows open road through deep drift at airport on U. S. 40



LEFT—Temporary end of road just west of the Donner Summit Maintenonce Station. (Popular ski slope in background.) RIGHT—Auger type rotary plow cutting through drift just east of Donner Summit.

the snow markers along the highway and the plow operators steer by feel. It is a fine, powder snow falling and the wind picks it up and drops it into the 16-foot-deep trough that is Highway 40.

The two push plows are soon helpless. Their drivers take shelter in a roadside garage.

By midafternoon the word comes through from headquarters: "Abandon the road."

An hour earlier, the newscast had told of the snowbound City of San Francisco, only a mile and a half from Yuba Gap, with 226 passengers aboard. And though the Highway Department had not yet been asked for help, Snider wanted to get his equipment back to the barn in case of emergencies.

But the new rotary is cut off at Baxters, 10 miles west, by 25-foot drifts. Old 1162 has broken an axle again and is helpless until a truck can deliver the parts.

Snider, in his pickup, reaches the third rotary just six miles to the west about dark. "Let's get her home," he yells above the blizzard.

They reach the two snowbound push plows and the rotary digs them out. The caravan turns back toward Yuba Gap. But after only a mile, the windshield wiper on the rotary breaks. Struck blind, she goes up and over the bank.

Long, Long Mile

Without the rotary, the other vehicles are helpless and the men walk a long, long mile through the howling darkness to shelter.

It is the first time since 1938 that Highway 40 has been abandoned to the elements.

The story of how Snider and the seven men with him dug out their rotary by hand the next day and battled drifts for 24 hours to rescue the passengers on the streamliner has already been told.

The next night, with the passengers safe, the Yuba Gap crew returned to the job of clearing Highway 40—now just a faint depression in the wilderness of white. The night and day struggle of the big rotaries has to begin all over again. And the next day a new storm strikes.

The battle in which Snider and the 27 men at Yuba Gap took part was only an incidental action in the total war the State waged against The Storm.

In all, the State had 1,200 men and some 400 snow plows and trucks in its battle lines.

Just how many thousands of tons of snow they moved, no one will estimate. But department officials say that more than 35 feet of snow has fallen at Donner Summit since those first few flakes last October.

The goal of the 1,200 men is simple—two lanes of black asphalt, with plenty of parking spaces.

And for this, the department spends an average of $500,000 each year. This year the snow removal bill is expected to reach $1,000,000.

SIERRA CREWS FIGHT DRIFTS

By JACK WELTER
San Francisca Examiner Staff Writer

EXAMINER BUREAU, SACRAMENTO, Jan. 26.—Unheralded heroes still battled in the high Sierra today against the worst winter of the century.

They are the dog tired members of state highway crews, fighting in constant danger for the 17th straight day to dig clear the two main transcontinental routes.

Treacherous avalanches of snow have killed three persons along U. S. Highway 50 alone. But the highway maintenance men with their spewing rotary plows have struggled on to the flanks of the summits on both U. S. 40 and U. S. 50.

Save Stranded

Their work was largely responsible for rescue of the City of San Francisco train crew and passengers. Since then they have saved many another stranded person and bucked roads through for transport of food and medicine to buried communities.

Often, they have had to backtrack hurriedly to save themselves when snow threatened to close in behind them. But without rest they return to the attack against their icy white enemy.

When they can clear the highways completely is an unanswered question. It depends on fate and weather. The outlook is not bright. Crews had to work 40 hours on a single drift on Highway 40. There are uncountable snowblocks ahead of that.

Main Enemy

"I wouldn't attempt to say when we'll have them open," said George F. Hellesoe, Division of Highways maintenance engineer. "It depends entirely on the weather. Our biggest enemy is wind.

"And," Hellesoe added gloomily, "we're now entering our heavy snow season. Ordinarily, our worst snow and blizzard conditions in the Sierra occur from about now to the end of February.

"If it hadn't been for the hurricanes and gales, we could have handled a 200-inch snowfall without too much trouble. But when you get hurricane winds, they blot out visibility, drift the snow and fill the roadbed entirely. Then the pushplows are no good and you have to send the rotaries through, backing and banging, to open a single lane.

"We're faced with the added problem of snowslides. So far these conditions have been worse on U. S. 50."

But Hellesoe noted that the worst is yet to come on U. S. 40, where rotaries have gnawed their way into a tremendous drift a thousand yards eastward from the division maintenance station on Donner Summit.

Steep, Smooth

"On the east side of both summits," he said, "the rock formation is very steep and very smooth. We know there have been almost continuous slides and drifts on Donner, and the problem is what will happen when we get to the area subject to slide. In one place, the highway cut is 50 feet deep on the inside, and on the outside of the road we know there's a big tank truck stalled. There's no sign of it at all."

Hellesoe said a snowslide is a more sinister menace than the average rock or earth avalanche.

Road Closed

"With a landslide, there usually are some warning fragments. But a snowslide gives no warning whatsoever. You don't know how they'll react until you get to them."

Primarily because of this ever present danger, the division of highways has kept U. S. 40 closed above Colfax even though it has cleared a deeply-entrenched two-way road to Donner Summit. The road also is open from Truckee to the foot of the grade on the east side. Traffic similarly is banned beyond Kyburz on U. S. 50, although a good roadway has been opened to Echo Summit maintenance station.

Unpredictable weather conditions and inability of overworked equipment to take time to clear parking areas are other factors. Hellesoe said a snowplow began bucking the Echo Summit drifts then was forced to pull out when the latest storm refilled the roadway as fast as it was cleared. Such incidents have occurred repeatedly.

Expanding on the danger of slides, he said there have been two across a quarter mile stretch of U. S. 50 bordered by an innocent-appearing meadow. One avalanche broke loose high on a mountainside, swept across the meadow and highway and snapped off a two foot thick tree on the opposite slope. Another Echo slide engulfed a parked Cadillac.

Car Squashed

"When it was finally dug out it looked like it had been through a big press," Hellesoe said.

Slides have recurrently blocked the Tahoe City-Truckee highway. Only a rotary plow, slicing perpendicularly with its cutting bars and feeding snow into its powerful blower with its six-foot high horizontal augurs, can handle such slides. Hellesoe accordingly constantly shifts heavy equipment to areas of greatest need, but seldom without criticism from those deprived of it.

Highway 40 has been closed since January 11th, and U. S. 50 since January 10th. Only once before, during the 1937-38 blizzards, has Highway 40 been closed more than temporarily since the State began keeping it open the year round in 1931. On that occasion it was closed 10 days. Regular clearance of U. S. 50 was begun in 1940-41 and 1941-42, abandoned during the war years, and resumed in 1945-46.

Tales of heroism, ingenuity and backbreaking labor are common among the State's highway men.

One of the brightest is the story of the events that preceded release of the stormbound passengers of the Southern Pacific's City of San Francisco streamliner on January 18th. They were transferred from the stranded train to a relief train at Nyack via a roadway gouged out by a lone state highway plow.

Foreman Jack Snider of the Yuba Gap Maintenance Station fought blizzard conditions on Monday, January 14th, to rescue two men stranded in push plows above Pioneer Station on United States 40. With an "express" truck and a rescued pushplow truck trailing him, he wandered off the edge of the highway at 7 p.m., Monday, under conditions of zero visibility.

At midnight, exhaustion, cold and hunger forced suspension of efforts to extricate the plow. The men made their way to a small lodge near Butts Lake,

where they first learned of the Streamliner's plight.

Shovel Job

From daylight until 4 p.m., Tuesday, they labored with shovels to clear 135 feet of roadway and get the rotary back on the road. In the meantime the roadway back to the Yuba Gap station had plugged full again and the rotary's windshield wiper failed.

With weather conditions and the mechanical failure blinding the plow crew, Snider used his intimate knowledge of the highway alignment to direct the convoy home via two-way radio to the rotary from his place in the following express truck.

The rotary reached Yuba Gap at 4 a.m., Wednesday; a fresh crew took over under more favorable weather conditions, and four hours later had covered the 1.3 miles to the point where the Streamliner's passengers were picked up by auto from Nyack Lodge.

At 11 p.m. the plow completed the return trip to Nyack and the way was clear for one of the most dramatic mass rescues in the colorful history of the high country.

"The only other rotary in the area was broken down," Hellesoe said. "It's a funny thing, but equipment, like human beings, is sometimes naturally obstinate. Always before, that one had been a maverick."

FROM ASSOCIATED PRESS

THE ASSOCIATED PRESS
Sacramento, California

January 31, 1952

MR. FRANK B. DURKEE
Director of Public Works
Sacramento

DEAR MR. DURKEE: I must express our appreciation for the splendid cooperation by the Department of Public Works during the difficult days of California's big storm a few weeks back.

The department's ready help facilitated news coverage of the marooned City of San Francisco in the Sierra and of road conditions throughout the State.

This was public service at its finest.

Sincerely,
(Signed)

MORRIE LANDSBERG
Correspondent



UPPER—Auger plow working in a deep drift east of Donner Summit on U. S. 40, Donner Lake in distance. CENTER—Clearing a path through a deep drift at airport on U. S. 40. LOWER—Twin Bridges resort on U. S. 50 partly destroyed by snow avalanche which swept down from slope in background, killing two persons.

Christmas Gift

Hollywood Freeway Through Los Angeles Civic Center Open to Traffic

By R. C. KENNEDY, Secretary, California Highway Commission

THE CITY OF LOS ANGELES received a Christmas present from the California Highway Commission and the Division of Highways on December 20th, last, for on that day a half mile of the Hollywood Freeway, extending through the Civic Center, was open to traffic.

Sponsored jointly by the Downtown Business Men's Association, Central Business District Association and the Los Angeles Traffic Association, dedicatory ceremonies started at 11 a.m.



PAUL O. HARDING

Robert Mitchell, President of the Los Angeles Metropolitan Traffic Association, presided and the usual coteries of state, city and county officials all made appropriate remarks.

Among the speakers were: Robert Mitchell, President, Los Angeles Metropolitan Traffic Association; Mayor Fletcher Bowron, Roger Jessup, Chairman, Los Angeles Board of Supervisors; Postmaster M. D. Fanning, Harold Henry, President, Los Angeles City Council; City Engineer Lloyd Aldrich, Oscar Trippet, President, Los Angeles Chamber of Commerce; Harry Volk, Neil Petree and Felix Chappellet, Metropolitan Traffic and Transit Committee; City Traffic Engineer Ralph Dorsey, Chief of Police William Parker, Assistant City Engineer Lew Arnold, Bernard Caldwell, Howard Stites and Eugene P. Clark, President, Central Business District Association.

Paul Harding, Assistant State Highway Engineer in charge of District VII, called attention to a number of members of his department and the different contractors who had made the work possible. Harding lauded Spencer Cortelyou, who immediately preceded him in charge of District VII, and who is now retired.

Edward R. Valentine, president of the Downtown Business Men's Association, spoke on the importance of freeways and especially of this small section that was being opened, and complimented the Highway Commission and the Division of Highways on the job they were doing.

The final address was given by Highway Commissioner Harrison R. Baker.

"The opening of this relatively short portion of freeway today is important because it directly affects about 100,000 people daily, about a half a million people daily indirectly, and about four million people with a vision of things to come," Valentine said.

"It is important because it provides access roads for hundreds of thousands of people daily to come and go from their business, their jobs, and their shopping in the biggest destination center west of Chicago, Downtown Los Angeles.

"There was a time when the road builder thought, rightly, only of a straight road between two points. Yet we know that the State Division of Highways, and the City Engineer's office spent months of man-hours figuring the most important subject—how to get the cars where they want to go, from the freeway to office, job, or store.

"The opening of this portion of the freeway is important because 100,000 people will get relatively much more real good out of this little half-mile than they have so far from the six miles from Grand to Western. It is important because thousands of drivers now congesting downtown streets to get across town will use this freeway instead, and other thousands of our good citizens will get better use from downtown streets.

"It is important because we can begin to see the freeway picture start to develop. People are beginning to recognize the amazing savings in time.



CITY ENGINEER LLOYD ALDRICH

"People are beginning to be able to go from Hollywood to downtown, or from downtown to Hollywood in 15 minutes by automobile. They can go from Rosemead and Garvey to downtown (or vice versa) in 17 minutes. All this was *before* the opening of this half-mile. These access roads should take from 2 or 3, to 5 minutes off that time, depending on the time of day.

"The success of this freeway, where it's so sorely needed and can be so sorely tested, will insure the building of other freeways, *throughout* Los Angeles."

Boker Tells of Program

Commissioner Baker quoted figures to show the huge scope of the Freeway Program in Metropolitan Los Angeles. He said:

"As a member of the California Highway Commission it is my great pleasure to represent our Governor, Earl Warren and our Director of Public Works, Frank B. Durkee, on this occasion. Governor Earl Warren is vitally interested in the State of California and in the progress of the highway program that was initiated by him and incorporated in the Highway Act of 1947. Mr. Durkee, our new Director of Public Works, is also vitally interested in the highways of our State. Inasmuch as the Governor has called a meeting of his council to be held today, it is impossible for these two gentlemen to be with us. I know that both of these officials would be here if other state duties did not keep them away.

"There is another man who was vitally interested in the development of highways in our State who, if he were still alive, would be with us on this occasion. I am referring to the late beloved Charles H. Purcell who, as Director of Public Works, was largely instrumental in developing our present freeway system.

"This is a short but vital link of the Hollywood Freeway—in fact it is probably the most important link in the entire system of freeways. Not only does this link complete the five miles from Western Avenue but it gives a connection with the Ramona and Santa Ana Freeways. In addition, this link gives a good distribution of traffic from these three freeways into Downtown Los Angeles.

Historic Spot

"This is an historic spot. We are bringing this great freeway into the heart of a city of 2,000,000 people almost adjacent to the original plaza where Los Angeles started as a sleepy pueblo in 1781.



UPPER—Ready for ribbon cutting (left to right), Senator Jack Tenney, Robert Mitchell, Ed Ainsworth, Mayor Fletcher Bowron, Commissioner Harrison R. Baker, Supervisor Roy V. Darby. CENTER AND LOWER—Official caravan of autos uses newly opened freeway section.

"This one-half mile of the Hollywood Freeway, which we are opening today, is the culmination of a spirit of cooperation rarely seen in state government. I am speaking of the cooperation of the city and county of Los Angeles with the Division of Highways in arriving at an equitable solution of the location of this particular piece of the Hollywood Freeway.

"Very few people know the amount of money that has been allotted, by the Highway Commission, and has been spent by the Division of Highways in the construction of this one freeway. Up to date, the commission has allotted and the Division of Highways has spent $49,100,000 on this freeway from Los Angeles Street to Vineland Avenue in the valley. On top of the $49,000,000 there is $5,140,000 in the 1951-52 Budget of which $3,900,000 is not yet under contract. In the 1952-53 Budget there has been allotted $650,000 to finish the job. That grand total will be somewhere in the neighborhood of $55,000,000 for the complete Hollywood Freeway from Los Angeles Street to Vineland. This section that is being opened today represents an expenditure of $4,212,600 for construction and $2,146,000 for right of way, making a total of $6,358,600 for this particular piece of highway. In that amount is $354,318 contributed by the City of Los Angeles and $271,516 by the County of Los Angeles. This money was turned over to the State for grading and rights of way in removing Fort Moore Hill. The Division of Highways made available to the city and county level land suitable for the expansion of the civic center.



Looking westerly, showing in foreground Los Angeles civic center buildings and Hollywood Freeway construction through civic center and westerly

More Work to Come

"There are several other contracts yet to be let and quite a little work yet to be done before the Hollywood Freeway will be a complete job. On the section from Western Avenue to Hollywood, the structures have all been completed. The bids for the grading and paving of this section were opened on December 13th and the award will probably be made within the next 10 days. This job is contemplated to be finished in the late fall of 1952. At the present time there is quite a little work being done in the way of structures between Hollywood Avenue and Cahuenga Pass. Award of a contract for construction of the last unit of Hollywood Freeway in the City of Los Angeles is pending. Bids for the project were opened in Los Angeles on January 31st.

The final section of the freeway will be between Mulholland Drive and Cahuenga Boulevard and between Gower Street and Hollywood Boulevard. This contract will complete the freeway

from Alameda Street near the Union Railroad station through Cahuenga Pass. When the award of contract is made, all major units of the Hollywood Freeway either will have been completed or placed under contract.

The low bidder on the final unit was Bongiovanni Construction Co., Los Angeles, $2,274,336.30.

The project involves the construction of three bridges, one pedestrian undercrossing, extensions to two existing pedestrian undercrossings and 11 retaining walls and the grading and surfacing of 1.4 miles to provide a six-lane divided highway.

Coming down to this end of the Hollywood Freeway the contract for the work to be done from the Alameda Street underpass to Lyon Street will be advertised sometime in the spring of 1952 and should be completed sometime the middle of 1953. From Lyon Street to the Aliso Street bridge the work will be advertised in the spring of 1953 and should be completed sometime the middle of 1954. In addition to this work on the ground, there is quite a little work to be done on the Aliso Street bridge, which we term as part of the Santa Ana and Ramona Freeways.

Harbor Freeway

"Many people are interested in the work being done on the Harbor Freeway. All the work necessary for this particular job, from Temple to Third Street, is under way and should be completed sometime next spring. The section from Third to Olympic Boulevard will be advertised late in 1952 and should be completed late in 1953.

"To make this section of the Harbor Freeway really do its job, it is going to be necessary to connect it with the Arroyo Seco Parkway. It is now contemplated that in the spring of 1952 the contract will be advertised for the work from Adobe Street to the four-level structure and this work should be completed late in 1952. When that is done there will be full and complete interchange provided for traffic between the Hollywood, Arroyo Seco and Harbor Freeways.

"We of the Highway Commission and the Division of Highways have found that when we open a section of a freeway the traffic somehow finds its way there. A year ago when we opened the section from Grand Avenue to Silver Lake Boulevard, we had an average of 30,000 cars a day using that section. When we first extended the Hollywood Freeway, last September, to Western Avenue we found that 45,300 cars were using that much of the Hollywood Freeway. Since that time the growth has been phenomenal and the Hollywood Freeway from Grand Avenue to Western is now carrying over 70,000 cars per day. Just what the total number of cars will be, after completion of the freeway, is problematical, but will, no doubt, approximate 100,000 cars per day.

"While these freeways cost millions of dollars they will more than repay their cost by direct savings to the motorists using them, in addition to the added convenience in their use and the savings in human lives due to the safety features built into them. While I am on my feet I would like to compliment both the city and the county of Los Angeles for the manner in which they have cooperated with our Division of Highways in arriving at a satisfactory conclusion to a lot of difficult questions."



Looking easterly along Hollywood Freeway, taken from above Melrose Avenue, showing in foreground the split between roadways to accommodate future connections with proposed Santa Monica Freeway

Ramona Freeway

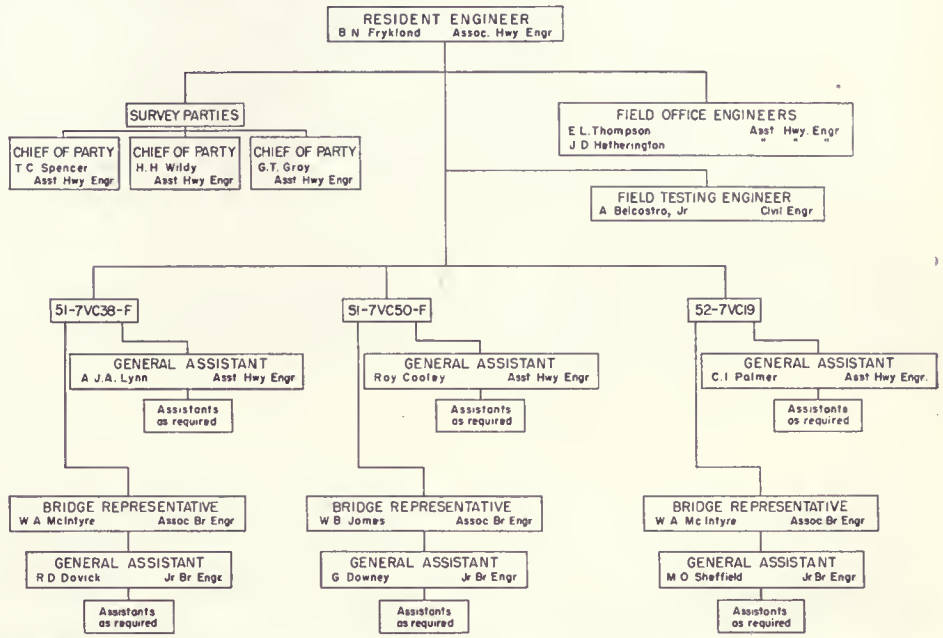
Engineering Personnel Is Organized Efficiently

By B. N. FRYKLAND, Resident Engineer

In September, 1949, work was started on the first postwar section of Ramona Freeway, from Evergreen Avenue to Helen Drive, a distance of 1.8 miles. This project was completed in April, 1951, at an approximate cost of $1,230,000. This work was described in a story by P. O. Harding, Assistant State Highway Engineer, in the September-October 1951 issue of the *California Highways* and *Public Works Magazine*.

The second section, from Helen Drive to Hellman Avenue, Contract 51-7VC38-F, a distance of 1.5 miles, was approved in February, 1951, and is now approximately 60 percent complete. The estimated date of completion is November, 1952. The total cost will be approximately $1,950,000. J. E. Haddock, Ltd., is the contractor with Henry Ralston, the job superintendent.

The third section from Hellman Avenue to Eighth Street, Contract 51-7VC50-F, a distance of 0.9 miles, was approved August 4, 1951, and is now approximately 35 percent complete. The estimated date of completion is March, 1953. The estimated total cost is approximately $1,303,000. Griffith Company is the contractor with J. F. Porcher as job superintendent.



UPPER—Job organization chart. LOWER—Looking easterly from Warwick Avenue pedestrian overcrossing, showing construction in progress on Ramona Freeway.





Looking easterly from Almansor Avenue along eastbound roadway of Ramona Freeway, showing Mark Keppel High School in City of Monterey Park on right

The fourth section from Eighth Street to Jackson Avenue, Contract 52-7VC19, a distance of 1.7 miles, was approved on November 28, 1951, and is now approximately 15 percent complete. The estimated date of completion is July, 1953, and the total cost will be approximately $2,600,000. The Griffith Company, with J. F. Porcher as superintendent, is also the contractor for this construction.

The work in general on the three going contracts consists of grading and paving two 36-foot roadways of the freeway section, grading and surfacing of the necessary frontage roads, acceleration and deceleration lanes, off and on ramps, and construction of underpass and overpass bridges. Prior to the starting of grading operations a large amount of storm drain and sanitary sewer construction was necessary, as well as considerable work by the various utility companies in moving their facilities.

Bridges Total 29

The necessary grade separations for vehicular, railroad, and pedestrian traffic require the construction of 29 bridges and one pedestrian undercrossing. Proceeding from west to east over the three contracts the bridges are located as follows:

Floral Park Bridge carries the tracks of the Pacific Electric Railroad over the westbound freeway.

Floral Park On Ramp carries westbound South Frontage Road traffic over eastbound freeway to westbound freeway.

Warwick Road, Campbell Avenue, and Marguerita Avenue Pedestrian Overcrossings carry pedestrian traffic over two frontage roads, the Pacific Electric Railroad tracks, and both freeway roadways.

Fremont Avenue bridges carry both freeway roadways and the Pacific Electric Railroad tracks over Fremont Avenue. The work in this section results in a modified interchange which will permit traffic ingress and egress to both the westbound and eastbound freeways.

Raymond Avenue Bridge carries the westbound freeway over Raymond Avenue to provide access to the Pacific Electric Railroad substation and team track.

Atlantic Boulevard, Garfield Avenue, and New Avenue bridges carry the freeway roadways, the Pacific Electric Railroad tracks, and the frontage roads, or off and on ramps over these cross streets. These bridges, with the necessary connecting roadways, form complete traffic interchanges.

The Sixth Street bridges carry the abovenoted tracks and roadways over Sixth Street.

Almansor Avenue Bridge carries Almansor traffic over the Pacific Electric tracks and all roadways.

The last mentioned grade separations are not of the interchange type.

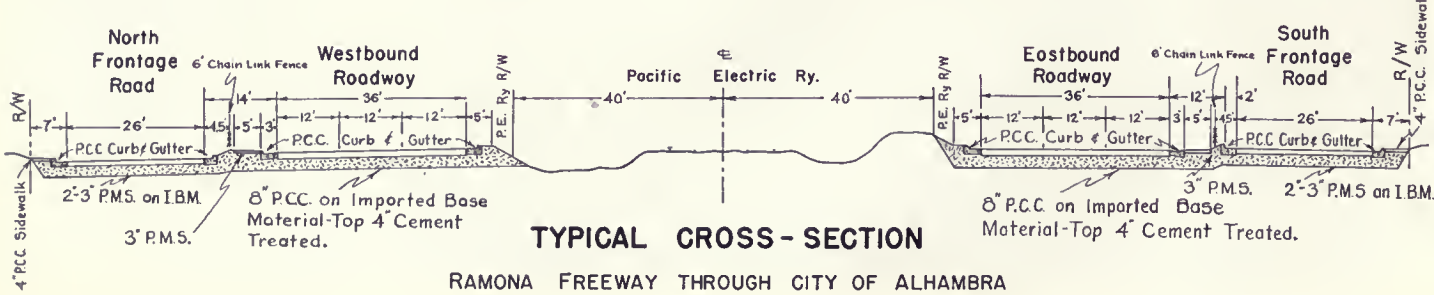
The Jackson Avenue Pedestrian Undercrossing is an extension of an existing undercrossing under the Pacific Electric Railroad tracks, made necessary by the construction of freeway roadways on each side.

Troffic Major Problem

Due to the fact that the jobs lie within the limits of cities of Los Angeles, Monterey Park, and Alhambra, as well as being partly in unincorporated areas, the proper handling of the traffic on the first section, from Evergreen Avenue to Helen Drive, and on the second section, from Helen Drive to Hellman Avenue, was a major problem. It was necessary to provide for a free flow of traffic up to 40,000 vehicles per day through the construction zone at all times. The problem is not so acute on the third and fourth sections although Atlantic Boulevard, Garfield Avenue, Almansor Avenue, and New Avenue carry a considerable volume of traffic.

It is anticipated that the completion of the three going contracts, which

. . . Continued on page 49



TYPICAL CROSS-SECTION

RAMONA FREEWAY THROUGH CITY OF ALHAMBRA



UPPER—Floral Park undercrossing that will carry westbound Romona Freeway under tracks of Pacific Electric Railway. CENTER—Easterly along Romona Freeway, Floral Park on ramp in foreground and Warwick Avenue pedestrian overcrossing in background. LOWER—Warwick Avenue pedestrian overcrossing, showing steel girders in place and spiral ramp construction at ends.

Santa Ana Freeway

Rapid Progress Is Being Made on Important Project

By W. L. FAHEY, District Engineer, District VII

Santa Ana Freeway is one of the most important traffic arteries on the system of freeways now being constructed by the State Division of Highways to serve Southern California. It is perhaps of equal importance with the Hollywood Freeway because one freeway is a continuation of the other. From the standpoint of through traffic the two freeways will operate as a unit.

The Santa Ana Freeway extends from Spring Street in the Los Angeles Civic Center Area in a general southeasterly direction 34 miles to First Street in the City of Santa Ana. The inception of this freeway dates back about 12 years and during that interval, due to the wholehearted cooperation of county and city officials and organizations and the financing provided by the Collier-Burns Highway Act of 1947, Santa Ana Freeway is now well along toward completion.



Of Strategic Value

The fact that Santa Ana Freeway follows a northwesterly-southeasterly direction, generally paralleling the Pacific Ocean coast line, makes it of great strategic value because so many of the other important traffic arteries in this part of the state have been established in a general northerly-southerly or easterly-westerly direction.

Development of Santa Ana Freeway, bringing as it does Orange County closer to the Los Angeles Metropolitan Area, measured in travel time, will prove of immense benefit to both areas. The development of critically needed housing projects and large industrial manufacturing plants along the route of Santa Ana Freeway is an indication of the economic value of this freeway in land development to its highest and best use.

Three Sections Completed

As of the present time we have three sections of Santa Ana Freeway which are completed and open to traffic, as follows:

(1) Aliso Street to Eastman Avenue, 3.6 miles; (2) Atlantic Boulevard to Union Pacific Railroad Crossing, 0.9 miles; and (3) Rosecrans Avenue east of Norwalk to Los Angeles Street south of Anaheim, 11.4 miles.

On the third unit listed above it should be noted that freeway construction has been completed except at the important cross streets. At these locations intersections at grade have been channelized and signalized so that traffic moves freely and safely. Due to the inadequacy of funds available for freeway construction, it appeared desirable on this section of Santa Ana Freeway to get the main roadway portion of the freeway completed and opened to traffic as quickly as possible, delaying the more expensive and time-consuming construction of grade-separation bridges to be carried out during future years when funds do become available.

Five Construction Projects

At the present time the State Division of Highways has five major construction contracts under way on Santa Ana Freeway, comprising a total length of 9.4 miles and representing an expenditure of almost $10,000,000. These contracts are as follows:



LEFT— Looking northwesterly along Santa Ana Freeway, showing 0.09-mile length of completed freeway under Atlantic Boulevard and under tracks of Union Pacific Railway. In foreground is Atlantic Boulevard overcrossing and in background, left, is construction in progress on Olympic Boulevard overcrossing. The interchange system in the foreground has been referred to as the "Mix-Master." RIGHT— Looking southeasterly along construction in progress in Santa Ana, showing in foreground erection of abutments for 17th Street undercrossing.

Description	Contractor	Resident engineer	Miles	Allotment
6-lane Freeway between Eastman Avenue and Atlantic Boulevard	Winston Bros. Co.	H. E. Belford N. G. Hallin	1.1	$1,184,300
6-lane Freeway from Augusta Avenue to Washington Boulevard	United Concrete Pipe Corp. & Ralph A. Bell	H. Ayanian J. M. Curran	2 3	1,742,100
6-lane Freeway from Washington Boulevard to Todd Avenue	United Concrete Pipe Corp. & Ralph A. Bell	H. Ayanian J. M. Curran	1.5	1,546,200
6-lane Freeway from Todd Avenue to Lakewood Boulevard	United Concrete Pipe Corp. & Ralph A. Bell	H. Ayanian J. M. Curran	2.0	2,701,200
4-lane Freeway from Broadway to First Street in Santa Ana	Winston Bros. Co.	C. C. Smith F. E. Sturgeon	2.5	2,656,300
Totals			9.4	$9,830,100

Completion Dates

By the end of 1952 or early in 1953 it is anticipated that all of these construction contracts will have been completed and that Santa Ana Freeway for the 10-mile length between the Los Angeles Civic Center and Rosemead Boulevard will be open to public traffic. However, Santa Ana Freeway traffic will not have the use at that time of the diagonal freeway routing shown on the map, from Rosemead Boulevard east of Rio Hondo to the town of Norwalk, for another year or two. This will not be a serious detriment because in the meantime traffic will have the use of a modern four-lane divided limited access highway as

now completed to the south on Rosemead and Lakewood Boulevards and to the east on Firestone Boulevard.

Another incomplete section of the Santa Ana Freeway, speaking as of the end of 1952, will be the short section in the vicinity of the Santa Ana River. The existing state highway at this location has a paved width of 56 feet, providing four lanes for moving traffic with side lanes for parking of vehicles. Thus traffic will not be greatly discommoded although it cannot move here as freely and safely as it will on the new freeway when completed.

Concerning the construction contracts now in progress, the resident engineers on these jobs make the following reports:

By H. E. BELFORD, Resident Engineer

On November 27, 1950, Contract 51-7VC23F in the amount of $1,112,-920.00 was awarded to Winston Brothers Company for constructing portions of Santa Ana Freeway, about 1.1 miles in net length, between Eastman Avenue and 0.1 mile westerly of Atlantic Boulevard, Road VII-LA-2,166-D,A.

The work included under this contract consists of clearing and grubbing, removing and disposing of portions of existing concrete pavements, curbs, gutters, sidewalks and structures; grading a roadbed to provide a six-lane divided freeway; surfacing with Portland cement concrete pavement on cement treated subgrade over imported base material; placing plant-mixed surfacing on shoulders; constructing accelerating and decelerating lanes, interchange roadways and outer highways, and surfacing them with plant-mixed surfacing on untreated rock base over imported base material. A reinforced concrete pedestrian undercrossing consisting of a box structure 122 feet in length and 10 feet in width with stairway entrances was provided at Eastman Avenue.

Bridge Structures

A reinforced concrete box girder overcrossing bridge consisting of four spans about 213 feet in total length, supported on reinforced concrete bents and abutments constructed on reinforced concrete cast-in-place piles and providing a clear roadway width of 40 feet, with two 5-foot sidewalks was provided at Downey Road. Also included in the contract was a reinforced concrete box girder overcrossing bridge for Olympic Boulevard, consisting of four spans and about 417 feet in total length supported on reinforced bents and abutments (no piles) and providing a clear roadway width of 70 feet with two 6-foot sidewalks. The bridge construction on this contract is under the supervision of N. G. Hallin, Resident Engineer for the Southern Section of the State Highway Bridge Department.

This contract also includes miscellaneous drainage structures, curbs, gutters and sidewalks, guard railing, chain link fence, reinforced concrete pipe culverts and siphons, vitrified clay pipe for sanitary sewers, drainage and electrical equipment and various other materials and items of work.

Rapid Progress

To date construction work on this project is about 58 percent complete. Construction of all north and south outer highways, the Eastman Avenue storm drain structure and pedestrian undercrossing, the Downey Road overcrossing bridge, the installation of sanitary sewers and storm drain siphon pipes has been entirely completed. Approximately 75 percent of all roadway excavation has been completed and the contractor is now concentrating on construction of the Olympic Boulevard bridge, which must be completed and traffic routed over it before any further road construction can be accomplished. This bridge should be completed sometime in April, 1952.

During construction of the Downey Road and Olympic Boulevard bridges, traffic is being carried around the bridge sites over the outer highways and specially constructed detour roadways connecting therewith that were all constructed as the first order of work on this project. Traffic has been operating over these detours for the past year with practically no hindrance or delays. In fact, westbound traffic into the City of Los Angeles has been faster over the detour than it was over the previous route.

Wells Are Replaced

Five domestic water wells of the California Water Service Company, developing approximately 1,900 gallons per minute, which were in the right of way in the vicinity of the Downey Road and Olympic Boulevard bridges, had to be abandoned and new replacement wells drilled on new sites outside the right of way prior to construction of the highway.

All excess roadway excavation on the project was disposed of in embankment areas on the proposed Los Angeles River Freeway just southerly of the project, the material being placed and compacted in accordance with the Standard Specifications. The contractor used 15.5 cubic yard model 7-TDT Euclid scrapers for hauling roadway excavation to the Los Angeles River Freeway embankment area. The average haul distance was about 3,000 feet and each scraper hauled approximately 100 cubic yards per hour to the embankment area during peak operations.

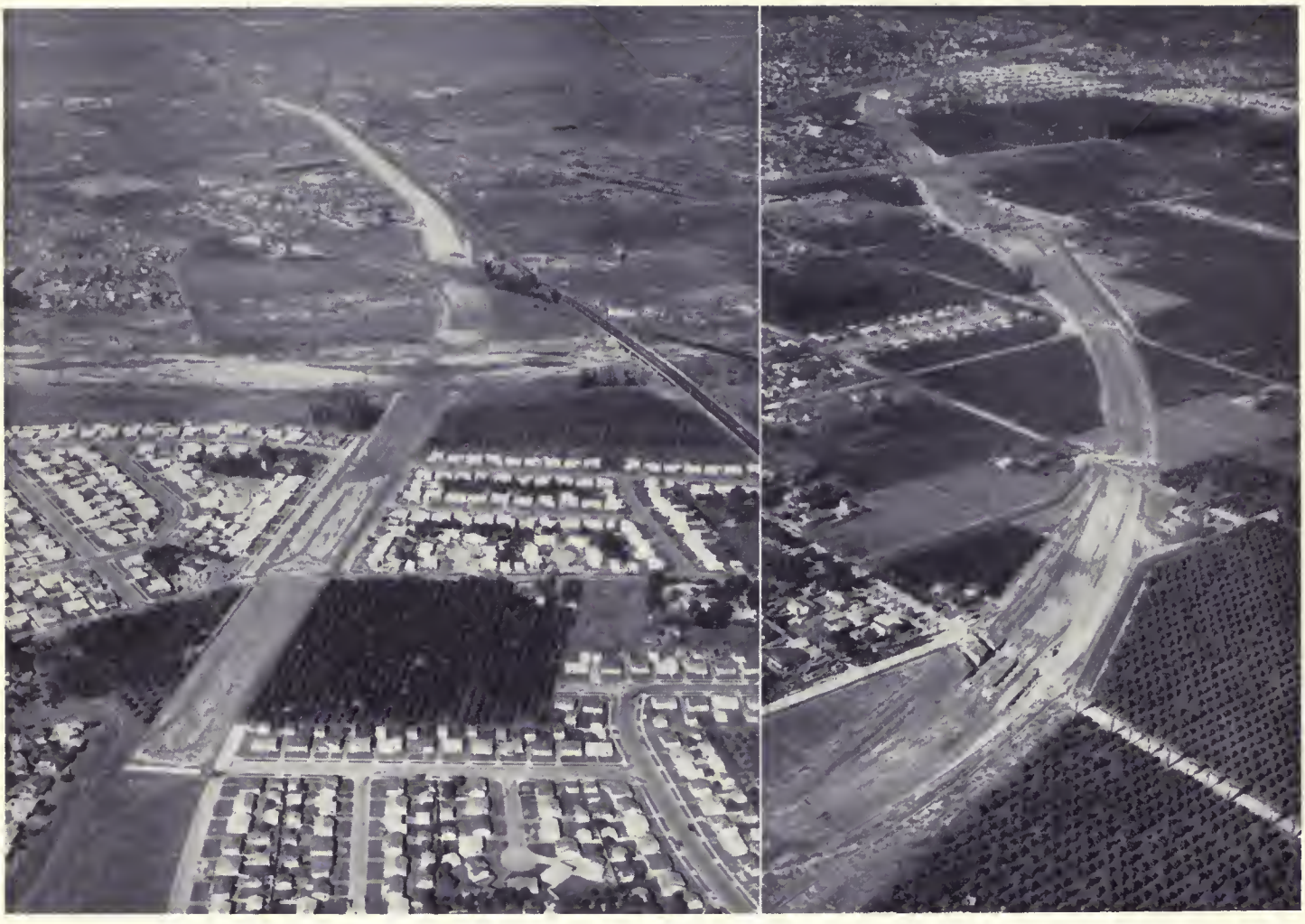
The span between bents No. 3 and No. 4 of the Olympic Boulevard bridge over the westbound roadway of the freeway is 145 feet, 6 inches. This is the longest box girder span constructed to date in the State and probably in the entire United States. Construction of the Olympic Boulevard bridge was delayed about four weeks due to curtailment of reinforcing steel by the Federal Government last fall. However, it is believed the contractor will complete this contract prior to August 19, 1952, the revised date of completion considering lost time for non-working days due to rain, at which time construction easterly to Washington Boulevard under another contract should be completed, making it possible to open to traffic an additional 3.2 miles of this important freeway from its present easterly terminus at Eastman Avenue.

By H. AYANIAN, Resident Engineer

The rapidly extending Santa Ana Freeway is being materially advanced by a series of three contracts being performed by the United Concrete Pipe Corporation and Ralph Bell under



UPPER—View looking southeasterly along Santa Ana Freeway, showing in foreground construction in progress on the Olympic Boulevard overpass. LOWER—View looking northwesterly along freeway, showing construction in progress on the Garfield Avenue undercrossing and Santa Fe Railroad grade separation.



LEFT—Looking northwesterly along Santa Ana Freeway construction, taken from just above Paramount Boulevard, showing in central portion of photograph approaches graded for the Rio Hondo crossing. RIGHT—Looking northwesterly along freeway construction in City of Santa Ana, showing in the foreground, left, present southerly terminus of the freeway at First Street and the excavation in progress for foundations for the Fourth Street overcrossing.

a joint venture. These three connecting contracts in one fell swoop will provide a six-lane divided freeway from near the junction of Olympic Boulevard and Anaheim-Telegraph Road to 0.2 miles beyond Lakewood Boulevard, including nine major structures, three pedestrian overcrossings, and a pedestrian undercrossing. The only exception in this stretch of six miles is the previously completed Griffith Company contract, 0.9 mile in length, at the Atlantic Avenue and Union Pacific Railroad grade separations.

The first contract, VII-LA-166-A, 51-7VC17-F, from Augusta Avenue to 0.2 miles southeasterly of Washington Boulevard, includes grading, PCC pavement, Marianna Avenue On-Ramp, Eastern Avenue Overcrossing, Kern Avenue Pedestrian Overcrossing, Gaspar Avenue Pedestrian Overcrossing, Washington Boulevard Undercrossing, and associated storm drains, sewers, and frontage roads.

Heavy Cut Section

The grading for this project consisted of a heavy cut section at the beginning of the job and the haul of this material, for distances of up to five miles, for embankments on the, at that time, future contracts. The overhaul was calculated in mile-yards and amounted to approximately 1,000,000 mile-yards. The material was all hauled in bottom dump truck and trailer units.

The sum of $1,748,000 was allotted for this first contract and work started on November 3, 1950, and is now about 60 percent completed. The estimated date for completion of all work is in June, 1952.

Second Contract

The second contract, VII-LA-166-A, 51-7VC41-F, covers the work from the end of the first contract to Todd Avenue. Included are the grading, PCC pavement, storm drains, sewers, the Simons Underpass at the mainline AT&SF R. R., the Garfield Avenue Undercrossing, the Greenwood Avenue Pedestrian Overcrossing, and frontage roads. In connection with the construction of the Simons Underpass, a shoofly was built with a temporary, timber pile supported, plate girder bridge to carry the rail traffic of over 40 trains daily over Anaheim-Telegraph Road.

This second contract was allotted $1,546,000 and work was started by the contractor on March 15, 1951. The estimated date for completion is in the

... Continued on page 46

Ridge Route

Reconstruction as Freeway Now Is Nearing Completion

By C. P. MONTGOMERY, District Construction Engineer

FORTY YEARS ago the hardy soul driving from Los Angeles to San Francisco left the pavement shortly after crossing the Los Angeles River, followed the Southern Pacific through the sand and chaparral, past the railroad sidings of Burbank and Pacoima to the little village of San Fernando. From here his trip took on the nature of an adventure as the road veered away from the railroad through the historic Fremont Pass past Newhall to Saugus. From Saugus there was a choice of either the Bouquet Canyon or the San Francisquito Canyon roads past Elizabeth Lake, the abandoned almond orchards surrounding Neenach, the old Bailey Ranch Hotel at Quail Lake and over the Tejon grade, past old Fort Tejon and down the Grapevine grade to the floor of the San Joaquin Valley.

The venturesome motorist, having demonstrated the stamina of both himself and his car in crossing the mountains, now faced a test of endurance as he negotiated the remaining 350 miles of dusty unpaved roads through the length of the valley.



Fremont Pass, a slot through the mountains, 15 feet wide and 60 feet deep, constructed in stages by hand methods during pioneer days, was in service until 1910, at that time the most direct route from Los Angeles to the north

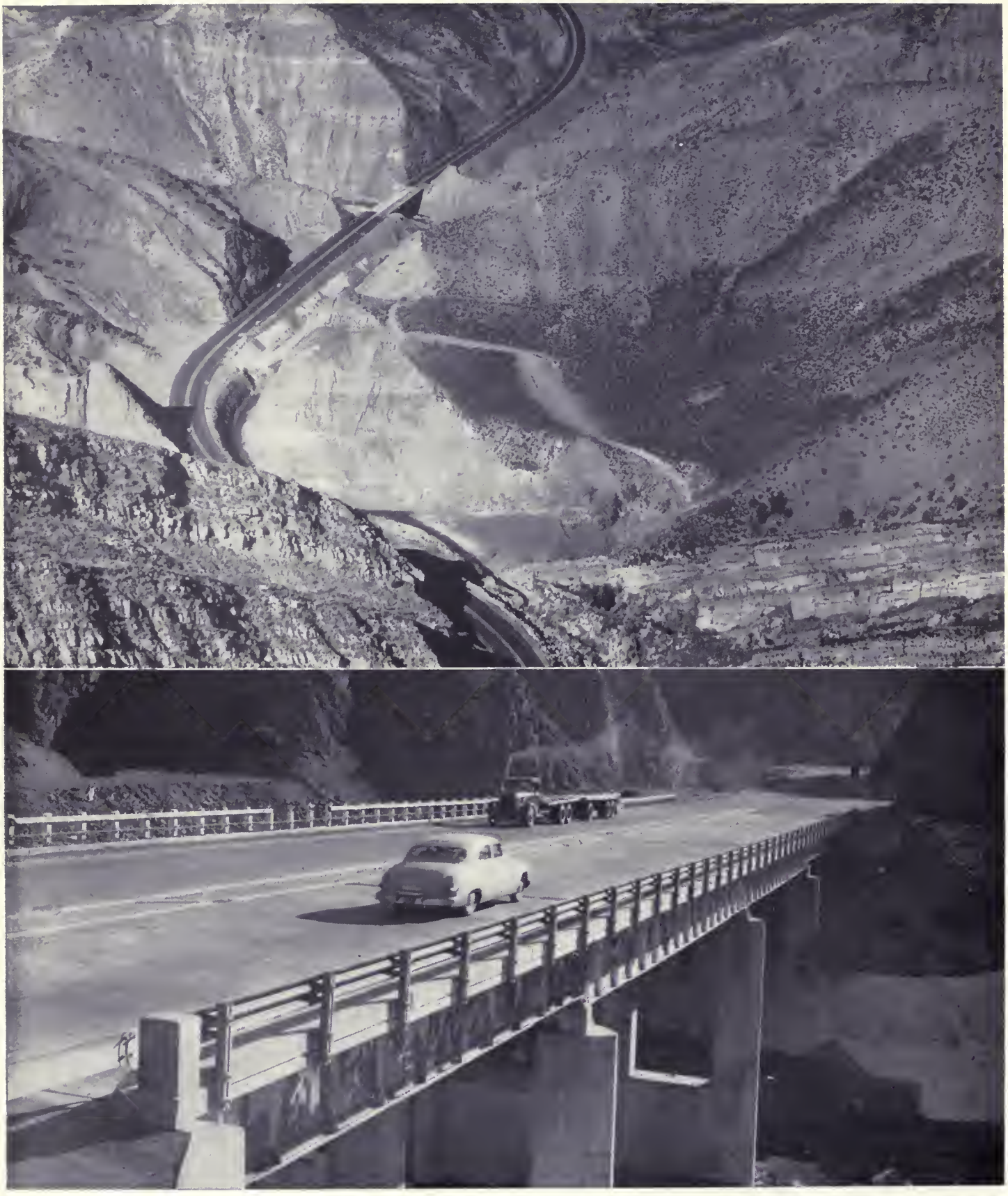
Challenge to Surveyors

Upon the formation of the California Highway Commission in 1911, a paved highway from the Mexican border through Los Angeles and San Francisco to the Oregon line, became the first order of business. Location surveys on this, the main north and south artery of the state highway system, were started in the early spring of 1912.

The mountains between Castaic in the Santa Clara River Valley and Ralphs Ranch, now Gorman, presented a challenge to the early location parties. The rugged terrain to be crossed was a primitive area with no trails, heavily covered with oak and

It is difficult for modern day motorists to believe that the present Ridge Route once looked like this





UPPER—Aerial view, looking northerly, showing completed Ridge Route in Piru George with Pyramid Cut in left foreground. LOWER—Looking southerly, showing completed Ridge Route with Piru Creek Bridge in the foreground.

pine timber at the higher elevations and a dense growth of brush on the slopes. The survey parties in moving their camps and transporting water and supplies were dependent upon pack trains of burros. To bring the cost of construction within the limits of the funds available at that time, the original location followed a circuitous course over the mountain ridges from Castaic past Sandberg to Gorman.

First Contract in 1914

The first contract on the original Ridge Road was completed by the Lee More Construction Company of El Paso in June, 1914. Subsequent contracts and work by state forces under day labor, led to the completion of that portion within District VII, as a 15-foot concrete pavement on 24-foot roadbed in 1920. In spite of the 7 percent grades, many sharp curves, narrow pavement and traffic tie-ups during winter snows, this old road so stimulated motor traffic between Los Angeles and points north, that an alternate improved route lying westerly of the old original Ridge Route from Castaic junction to Lebec became a necessity and was built in the early thirties.

While still known as the Ridge Route this new location provided a greatly improved alignment with much less curvature. By following along the Alamo and Piru Creeks through Piru Gorge the gradient was reduced by 10 miles.

Highway Widening Necessary

Very soon the volume of traffic on the new Ridge Route had increased to such an extent that the three-lane road became critically inadequate. It was apparent that the only solution was to provide a four-lane highway with the opposing lines of traffic separated by a median strip. With funds made available by the Collier-Burns Highway Act of 1947, the early completion of the Ridge Route throughout as a four-lane divided limited access freeway is assured.

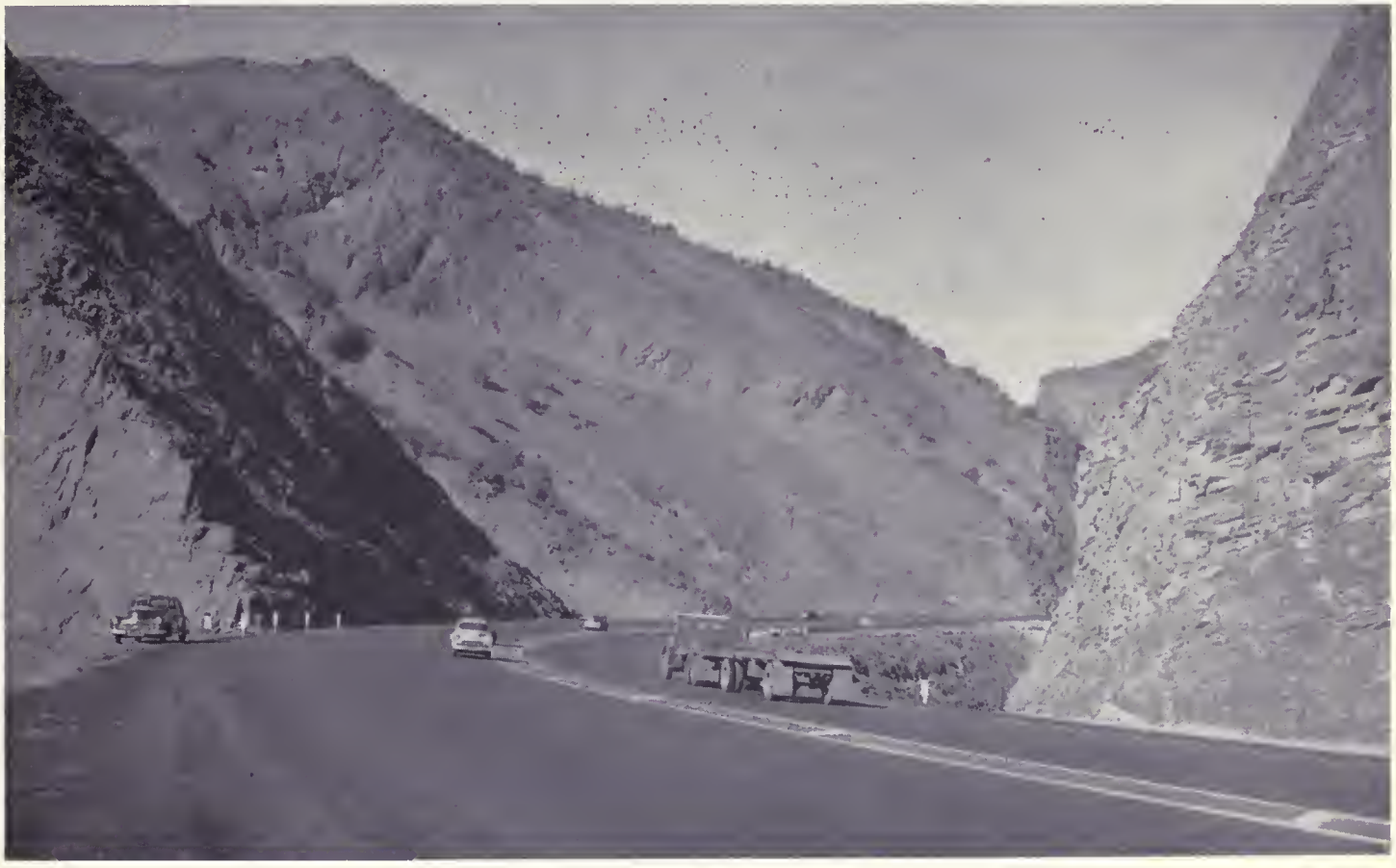
Piru Project Spectacular

Probably the most difficult and spectacular section of this highway is the recently completed contract through Piru Gorge from Frenchman's Flat to the Alamos Creek Bridge.

Earth work quantities involved in the widening of this five-mile section of roadway amounted to 1,110,000 cubic yards and overhaul from cut to fill 15,000,000 station yards. The need for construction of two bridges over Piru Creek at each end of the Pyramid Cut was eliminated by the construction of a channel change to carry Piru Creek through the cut along the east side of the roadway. The widening of the Pyramid Cut alone, including the Piru channel, required the excavation of over half a million cubic yards of a very hard shale rock. The cut face rises to a height of 310 feet from the bottom of the channel or the height of a 25-story building.

The paving on the southerly three miles is four-inch plant-mixed surfacing 72 feet to 78 feet in width divided by raised bars. The northerly 2.3 miles consists of two parallel pavements 29

Looking northerly on completed section of Ridge Route through Piru Gorge, showing Pyramid Cut on left; channel change on right





UPPER—Looking south from Pyramid Cut, showing completed roadway with channel change on left.
LOWER—Looking northerly along completed Ridge Route in Piru Gorge.

feet in width with penetration treated shoulders and separated by an unpaved decision strip eight feet wide. All pavement is supported by a subgrade of untreated rock base over a subbase of eight inches of crushed granite. Subbase and subgrade material were produced by the contractor from a crushing plant set up at the state-owned granite quarry several miles above the northerly end of the contract. The contractor also installed an asphalt plant at this location for the production of the plant-mixed surfacing.

Traffic Carried Through

The outstanding and probably the most difficult feature of this work was the fact that traffic was carried through the contract during construction. It was necessary to control traffic while grading was in progress and the contractor conducted his operations to insure a maximum of safety and a minimum of delay to the traveling public. While working through cuts where there was danger from falling rocks, traffic was halted for periods of from 20 to 30 minutes, and then all work suspended until both lines of traffic had passed through grading operations. Longer though less frequent delays occurred during blasting operations, a DW10 scraper and bulldozers were always available at such times to clear the roadbed as quickly as possible. These unavoidable delays seldom lasted over 45 minutes. This contract was completed by A. Teichert and Son of Sacramento at a cost of slightly less than $2,000,000, under the able supervision of Adolph Baure, representing the contractor, and C. J. McCollough, Resident Engineer.

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U.S. 99 Job

New Section of Four-lane Divided Highway Straddles Los Angeles-Kern County Line

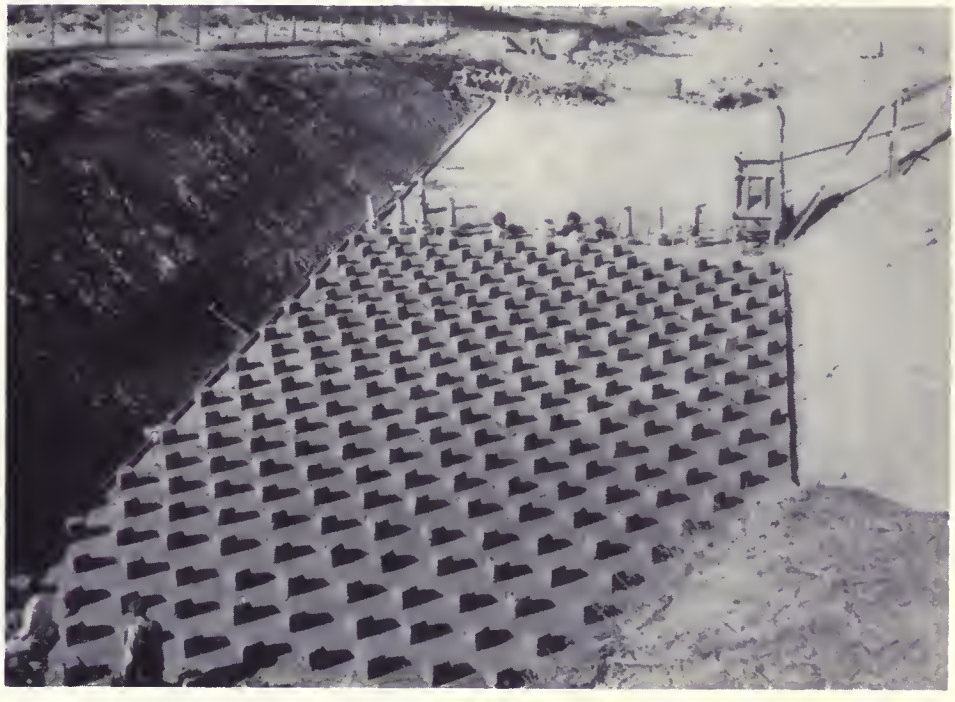
By W. M. NETT, Resident Engineer

CONSTRUCTION on an 11.4-mile section of U.S. Highway 99 known to the motorist as the Ridge Route was completed on November 8, 1951. This portion of highway forms the connecting link between two previously completed four-lane sections, the northern terminus being Fort Tejon, a United States Cavalry outpost which played an important part in early California history.

The southern terminus is 2½ miles south of the present Lancaster road, State Sign Route No. 138, which was part of the old original Ridge Route. This portion of the old highway from Gorman to Castaic via Sandberg which was by-passed by the three-lane construction in the mid 1930's, traversed terrain that inspired the name of Ridge Route, and which is still used to designate the entire route from the San Fernando Valley to the San Joaquin Valley.

At various locations in the present work the old three-lane highway is used for one-way of travel. The new





UPPER—Completed construction on Ridge Route southerly from Gorman. LOWER—Special blocks on concrete apron to dissipate force of water at discharge of channel on west side of road just south of Gorman. Note smudge pots used to prevent freezing of concrete.





UPPER—Completed section of Gorman project in Kern County. LOWER—Looking northerly along completed section of Ridge Route. Community of Gorman is shown in foreground to right and Tejon Summit shown in background right.

lanes are of Portland cement concrete pavement 24 feet wide over cement treated subgrade with plant-mix shoulders.

Huge Excavation

The project was located in two state highway districts. District VII, Los Angeles, was responsible for the preliminary surveys, plans, specifications, and rights-of-way procurement, while District VI with headquarters in Fresno took over the construction engineering.

Something of the magnitude of the project can be seen in a few of the major items of work.

Well over a million cubic yards of roadway excavation was moved 28,000,000 station yards to reach its final location.

Sixty thousand tons of pervious material was used as a blanket over a wet meadow area at Gorman, and 237,000 tons of processed base material was used in subgrade construction.

Forty-nine thousand cubic yards of Portland cement concrete was poured and 41,000 tons of plant-mixed surfacing was used for shoulders and resurfacing of portions of the old highway.

Structures were constructed at 192 locations, varying in size from an eight-inch drain to a 133-foot reinforced concrete bridge across Cuddy Creek. There was also considerable amount of channel change work with various types of erosion fences and protection devices.

One of the highest 1951 production records for Portland cement concrete pavement was attained as 49,000 cubic yards of concrete were laid in 47 starts. The largest single day's output was 1,393 cubic yards, and the smallest was 555.

Other Projects

An experimental section of weakened-plane joints was put in the concrete pavement. These joints were formed by use of the standard mastic paper placed at variable spacings, ranging from the standard 15-foot panels to 60-foot panels at right angles to the direction of traffic. A section of variable spacings with the joint on a skew of three feet in the 12-foot lane width was also placed to study the effect of the impact caused by separate wheel load applications rather than by axle loads as in the standard right angled joint.

With the completion of this project and another in Los Angeles County, and with another project now under construction in Los Angeles County, U.S. 99 will be four lanes from McFarland to Los Angeles.

Mr. E. E. Frost was superintendent for N. M. Ball Sons, Contractor. W. M. Nett was resident engineer for the State.

LEFT—Looking southerly along completed section of Ridge Route. Lebec is shown in foreground. Tejon Summit is just off upper left corner of photograph.
RIGHT—Looking southerly along completed section of Ridge Route southerly of Gorman.





An artist's conception of what the new Placerville freeway will look like and how it will serve both through and local traffic is provided in this drawing prepared by Van der Goes of the Bridge Department, State Division of Highways. The freeway agreement has been signed by State Director of Public Works Frank B. Durkee.

By JEROME F. LIPP, Right of Way Agent, District III

The Placerville City Council has been notified that the official agreement between the State and the city which clears the way for the early start of construction on the new freeway through Placerville has now been fully executed.

A copy of the document, signed by Director of Public Works Frank B. Durkee, was received from the office of District Highway Engineer C. H. Whitmore in Marysville. The agreement had previously been signed by the city.

Funds in the amount of $300,000 were allocated to the Placerville freeway project in the 1952-53 construction budget of the California Highway Commission. The first call for bids is scheduled for early this summer, contingent on the completion of right of way negotiations. The work to be placed under contract in the coming season includes the Locust Street Undercrossing, the Washington Street Overhead, and the relocation and adjustment of the railroad facilities at the east end of the city.

Pedestrian Crossings

Pedestrian overhead crossings are planned just east of Coloma Street, to provide for the safety of elementary school pupils, and at Bedford Avenue, near the post office. Both these structures will have modern ramp approaches.

Generally, in California when it is impractical to relocate improvements on properties within the right of way needed for highway construction, the properties are just purchased outright at their fair market value.

However, special cases sometimes arise in which, despite the fact that moving buildings to a new location appears to be impractical, the outright



purchase of the property and subsequent disposal of the improvements for salvage value not only would have a severe adverse effect on public attitude towards the department, but would leave the affected property owners in an untenable position because of the impossibility of providing a substitute facility, short of long and tedious new construction.

Just such a situation confronted the Division of Highways in its right of way acquisition program for the Placerville Freeway. This freeway constitutes a realignment of a section of U. S. Highway 50, one of the Country's principal East-West routes, also used extensively by recreation enthusiasts en route to the Lake Tahoe area.

Buildings Moved

Among the improvements within the required right of way for the Placerville Freeway were the brick veneer church of the Christian Science Society, the clubhouse of the Placerville Women's Shakespeare Club, and a specially built private residence. The clubhouse, cultural center of the community, is owned by a corporation consisting of 150 members. This building, which houses a large auditorium, a dining room, a kitchen, a second-story all-metal projection room, two restrooms, a stage complete with footlights, and dressing rooms, contains approximately 6,500 square feet. Besides being used by its members, the club house is used as a regular meeting place for many of the city's service clubs.

In addition to the church and club house, the stucco home adjacent to the club house, required special attention because the wife of the owner, a semi-invalid confined to a wheel chair, required a specially built house on a level lot.

All buildings, while in excellent condition, were approximately 20 years old. They could not be duplicated under present building conditions for anywhere near their present value.

Agreement With Owners

In order to expedite the right of way acquisition by reaching some sort of an agreement with the affected parties, a meeting was held with the members of the Shakespeare Club at the beginning of our right of way acquisition on the project. The State's acquisition

procedure was carefully explained and the possibilities of moving the club house were thoroughly discussed. This same procedure was followed concurrently with the owners of the Christian Science Church and the owners of the private residence. It was determined in these meetings that all three buildings should be moved to another location so that the loss in usage to the owners and the community would be minimized.

Whether or not the complete transaction, based on moving improvements, would cost the state more than an outright purchase at the fair market value of the properties needed was the principal limiting factor in the decision concerning the economics of moving improvements which were within the right of way. Of course, in any event, the property acquired was to be paid for at its fair market value.



Shakespeare Club moved to new location

New Site Chosen

A site about one block up hill appeared to be the only practical one because almost all usable lots in the city's steep-sided narrow valley were in use. It was also most desirable for all three properties. However, the purchase of the site was complicated by the fact that it was owned by El Dorado County, which can sell land only by public sale. In order to avoid the many complications resulting from this requirement, the state finally purchased the entire parcel and subsequently deeded the land in three individual parcels to the parties involved.

The selected site was an average of 14 feet below street level; consequently, it was necessary to place 10,000 cubic yards of fill material to bring it to grade. Fortunately, a large vacant lot on a steep hillside, directly across Jackson Street from the site, provided a convenient material source.

The owner of the hillside lot gave the State permission to remove the needed fill material, free of charge. The removal of the fill dirt from this lot resulted in an improvement to the area generally, since enough material was excavated to leave level building sites where none had existed before.

Christion Science Church was moved without cost to owners



State Pays Maving Costs

Negotiations were conducted on the basis of the owners retaining all improvements, and the State's paying the estimated cost of moving them. The State, in conjunction with the building committee of the Shakespeare Club, the church officials, and the owner of the residence, secured bids for all phases of the relocation work, including filling the site, moving, rehabilitation, and landscaping. Wilkins Draying Company of Sacramento were the successful bidders for moving the clubhouse, while Nick Martinelli, also of Sacramento, was low bidder for moving the other two units.

While the moving of the brick veneer church intact, without losing a brick, was quite a feat in this steep area, the relocation of the Shakespeare Club presented the greatest problem. It was necessary to cut the building into three pieces and move each separately. Even then, the largest piece was wider than Jackson Street, over which the buildings had to be moved. Therefore, part of the moving operation included moving a residence on Jackson Street back 30 feet, destruction of a garage and several retaining walls, and removal and replacement of a front porch from another house. This additional work barely provided sufficient width for the moving operation.

. . . Continued on page 61

Bay Bridge Bonds

On Friday morning, January 11, 1952, the sum of $21,000,000, plus accrued interest, was paid into the State Treasury in exchange for California Toll Bridge Authority revenue bonds in the amount of $21,000,000 to be delivered to their purchasers. The transaction involved the refinancing of the indebtedness of the San Francisco-Oakland Bay Bridge, including outstanding bonds and the amount due the State Highway Fund, and the providing of additional funds for improvements on the bridge to facilitate the movement of traffic.

It was necessary that the refunding be completed prior to January 15, 1952, in order to preserve the credit of the bridge looking ahead to the financing of future additional crossings of San Francisco Bay.

The sale of the bonds culminated proceedings which had their inception several years ago, when studies were made by the Division of San Francisco Bay Toll Crossings of improvements on the existing San Francisco-Oakland Bay Bridge and for approaches thereto which would fit in with any new crossing of San Francisco Bay.

Mayors Request Refinancing

On October 23, 1951, the mayors of the Cities of San Francisco and Oakland had joined in a recommendation to Governor Earl Warren, Chairman of the California Toll Bridge Authority, that the existing indebtedness of the San Francisco-Oakland Bay Bridge be refunded and that the new issue of bonds include sufficient funds to perform work on the present bridge, build additional approaches on each side of San Francisco Bay, and provide funds for a further study of an additional bay crossing.

At a meeting of the authority on November 27, 1951, a resolution creating an issue of bonds not exceeding $80,000,000, to be issued in series, was adopted. Only the sale of the first, or Series "A" bonds, was authorized, that series being in the amount of $21,000,000 for the purposes of refunding the presently outstanding bonds, repaying to the State Highway Fund the sum of approximately $6,600,000 appropriated in 1933 for construction of approaches, the appropriation providing for repayment after the original indebtedness of the bridge had been paid off; and approximately $7,000,000 for alterations and improvements on the existing bridge.

Other Series of Bonds

The resolution of the authority also provided for a Series "B" and Series "C" issue of $25,000,000 each, the proceeds to be used for the construction of approaches on the San Francisco side of San Francisco Bay, and for like purposes on the east side of the bay. Among the approaches designated on the east side of the bay is an additional tube under the Oakland Estuary which separates the Cities of Alameda and Oakland. Sale of the Series "B" and "C" bonds was not authorized at the November meeting.

A Series "D" bonds also authorized may not be issued until clarification of state and federal statutes affecting construction of new toll crossings of San Francisco Bay.

State Wins Decision

The opinion of the district court of appeal in the case of *Chas. L. Harney, Inc.*, a corporation, v. *Frank B. Durkee*, as Director of Public Works of the State of California, reported in 107 A. C. A. 714, became final on January 15, 1952, by the refusal of the Supreme Court of California to grant a hearing in the case.

Following the opening of bids for the construction of the section of the Bayshore Freeway in San Francisco from Army Street to 17th Street, the Director of Public Works rejected all bids and ordered a readvertisement for new bids. Chas. L. Harney, Inc., the low bidder on the first call, brought the action in the Superior Court in San Francisco to nullify the rejection of all bids and to force award of the contract to it on the ground that no lower bid could reasonably be expected.

The opinion of the district court of appeal reversed the superior court and upheld the action of the Director of Public Works in rejecting the bids.

The project has now been readvertised and new bids are scheduled to be opened on March 12th.

Walter Sandelin Again Appointed Commissioner

On January 26th, F. Walter Sandelin of Ukiah received from Governor Earl Warren his fourth appointment as a member of the California Highway Commission. His new term will end on January 15, 1956.



F. WALTER SANDELIN

When the new Highway Commission was created in 1943 Sandelin drew the short term and was reappointed by the Governor in January, 1944. He was reappointed January 15, 1948.

Commissioner Sandelin for many years has been active in highway development in the Redwood Empire counties. He is a veteran of World War I, past president of the Ukiah Rotary Club, past president of the Ukiah Chamber of Commerce and served as vice president and director of the Redwood Empire Association and as chairman of the transportation committee of the association.

Street Sweepers

Interesting Tests Made of Various Broom Fibres

By NORMAN H. HEGGIE, Assistant Physical Testing Engineer
Service and Supply, Headquarters

"A NEW BROOM sweeps clean."

This old English expression was handed down by John Haywood in 1546, years before anyone ever dreamed of such a thing as a power broom. As a matter of fact, the first power broom was not invented for another 300 years. "Kanes Famous First Facts" gives the following description of the first power broom used in the United States. It was demonstrated on December 15, 1854, in Philadelphia and described in the *Philadelphia Public Ledger* in the following manner:

"A series of brooms on a cylinder about two feet by six inches wide attached to two endless chains running over an upper and lower set of pulleys which are suspended on a light frame of wrought iron behind a cart. As the cart wheels revolve, a rotary motion is given to the pulleys, conveying the endless chains and a series of brooms attached to them, which being made to bear on the ground, successively sweep the surface and carry the soil up an incline or carrier plate over the top of which it is dropped into the cart."

Figure 1 depicts an early model horse-drawn sweeper. Of course, prior to the advent of the horse-drawn sweeper, the personal attention of the individual "white wing" was required to sweep up refuse on city streets (*Figure 2*).



UPPER—Street sweeping machine, 1905 model. LOWER—Early day sweeper and his outfit.

Power Brooms

What a far cry this was from our modern powered brooms! But, of course, everything must have a beginning. *Figure 3* shows the modern power broom used to sweep the San Francisco-Oakland Bay Bridge.

The Division of Highways uses power brooms to sweep the road surface preparatory to applying armor coat and nonskid surface treatments, seal coats and resurfacing blankets besides keeping the roadway on bridges and state highways within city limits free of debris.

Up until recently, little attention was paid to the actual cost of broom fibre in relation to the sweeping job accomplished, it being considered that the fibre was a means to an end and, as it was sometimes difficult to purchase some fibres, those that were readily available on the open market were therefore used. It was observed in the field that the use of some fibres resulted in a more thorough and cleaner sweeping job, with better wearing qualities than others.

Test of Fibres

The extent of these differences were not known, so, in an endeavor to determine the relative characteristics and wearing qualities of the various broom fibres available for use, the Service and Supply Department solicited the cooperation of the Maintenance Department in Districts VIII, IV and on the Bay Bridge to conduct a series of tests on the following fibres wound on the brooms of their power street sweepers: bass, hickory, polmyra, split polm, synthetic.

The bass, palmyra and split palm are natural palm fibres. The hickory is split from the hickory wood. The synthetic fibre is a manufactured article.

Preparatory to winding the palm, hickory and natural palm fibres, they were soaked or boiled in water, or steamed. The plastic fibre was applied dry. Time of preparation was not included in the cost analysis.

Sweeping Data

The tests consisted of winding the broom cores, (*Figure 4*), noting the time required and obtaining the weight of fibre and length of bristle at completion of winding. (*Completed broom, Figure 6*). The broom was then used in its regular manner and run until normal wear was reached. *Figure 5* shows a badly worn broom. The mileage swept and type of surfacing was noted together with the weight of the fibre and length of bristles remaining on the core at the end of the test run. On basis of these data, the cost of the fibre per mile swept, including cost of winding, was obtained. A total of 3,824 miles of roadway surface was swept in obtaining this test data, with an average of 128 miles being swept by each broom. The minimum mileage swept by any one broom was 43 miles, the maximum 242.

We were primarily interested in determining which type of fibre was the most efficient and the most economical to use. The relative efficiency of the brooms was not determined as detailed comments and remarks by the operators were not generally obtained. However, the relative cost per mile of the fibre, including winding of the broom was obtained on basis of the individual fibre and over-all use compared with the fibres used on different machines, and also when used on different types of surfacing. *Table 1* summarizes these findings.

Percent Loss in Weight

A wide variation in percent loss in weight and fibre length was obtained. The fibres lost an average weight of 52 percent during their serviceable life on the broom, with a minimum of 32 percent, maximum of 76 percent. They were reduced an average of 48 percent in length with a minimum of 38 percent and maximum of 73 percent. These wide variations were reflected in the cost per mile shown in *Table 1* for any one fibre, especially for the palmyra where average values ranging from $0.099 to $0.269 per mile were obtained. A particular point in case can be taken from the analysis of fibre wound on the broom for sweeper "C."

On the first winding with palmyra, the broom lasted for only 43 miles, with accompanying loss in weight of 65 percent, loss in length 66 percent and cost per mile of $0.472. On the second winding, the broom lasted for 179 miles with a loss in weight of 63 percent, loss in length of 59 percent, and a cost per mile of $0.112. Plant-mixed surfacing was swept in each case, using the same sweeper ond operator. There was no particular notation by the operator to indicate factors contributing to such a difference. Whether this was due to a difference in the roughness factor of the surfacing or a difference in applied pressure, or possibly to a variation in the inherent quality of the fibre itself is unknown.

Comparisons

The cores wound with bass, palmyra and split palm all seemed to give comparable sweeping results, however, it was reported that the bass broom was less efficient than the other two in some instances, and the palmyra did not pick up sand too well, but did give an overall satisfactory sweeping job.

This is special power broom used on the San Francisco-Oakland Bay Bridge



On basis of the data presented in *Table 1*, it appears that the average cost per mile of all of the individual fibres is quite close, with the exception of the synthetic fibre, which is obviously excessive. In addition to this cost factor, this fibre was found to be very brittle and difficult to wind, and when used, broke off at the cable in bunches. This fibre appeared to lack sufficient stiffness to carry the sweepings up on to the belts, yet the tips of the fibre would break off when striking obstructions such as rocks, bottles and ends of median bars, and did not result in a good sweeping job. Results obtained with the use of this fibre were so adverse that subsequent tests were not considered advisable. Furthermore, upon inquiry to the City of Sacramento Street Department, we found that they had experienced the same results with synthetic fibre.



Modern power broom of Division of Highways

Winding of Fibres

No difficulty was encountered in winding the various palm fibres. The hickory, however, was found to be quite difficult to wind on the core without a long soaking period. Considerable breakage occurred when using the straight hickory fibres, due to their extreme brittleness. There did not seem to be sufficient spring in the fibre to throw the material on the conveyor belts, resulting in poor sweeping quality.

The cores wound with half hickory and half palmyra did, however, give far superior results, both from a mileage and an economic standpoint, besides resulting in the best sweeping job. The material was intermixed during the winding operation. Stiffness was supplied by the hickory, making the

TABLE 1. SUMMARY OF TEST DATA OBTAINED ON SWEEPER BROOM FIBRES

Overall cost/mile* on basis of 30 brooms regardless of sweeper or type of surfacing	Mean averages	Bass	Hickory	½ Hickory ½ Palmyra	Palmyra	Synthetic	"Split Palm"
	$0.264	$0.230	$0.222	$0.122	$0.241	$0.630	$0.223
Sweeper							
A	.202	------	.232	.152	.099	------	------
B	.284	.375	------	------	.255	------	.370
C	.250	.184	------	------	.258	------	.199
D	.120	------	------	------	.120	------	------
E	.252	------	.170	.092	.117	.630	------
Type of Surfacing							
P.C.C.	.375	------	------	------	.120	.630	------
A.C.	.165	------	.178	.152	------	------	------
A.C. and P.C.C.	.119	------	.170	.092	.108	------	------
P.M.S. and R.M.A.	.242	.280	.246	------	.257	------	.223
Mileage Data—Regardless of Sweeper or Type of Surfacing							
Maximum	------	141	160	242	240	115	190
Minimum	------	108	96	167	43	115	59
Average	128	125	129	205	128	115	110

* Cost of fibre plus cost of winding.

broom capable of picking up the denser particles, while the suppleness of the palmyra provided a good "clean-up" quality. Little or no breakage of the broom was observed during its operation. The operators of the sweepers agreed that the brooms wound with half palmyra and half hickory fibres did a much better job than any other broom tested.

Cost Per Mile

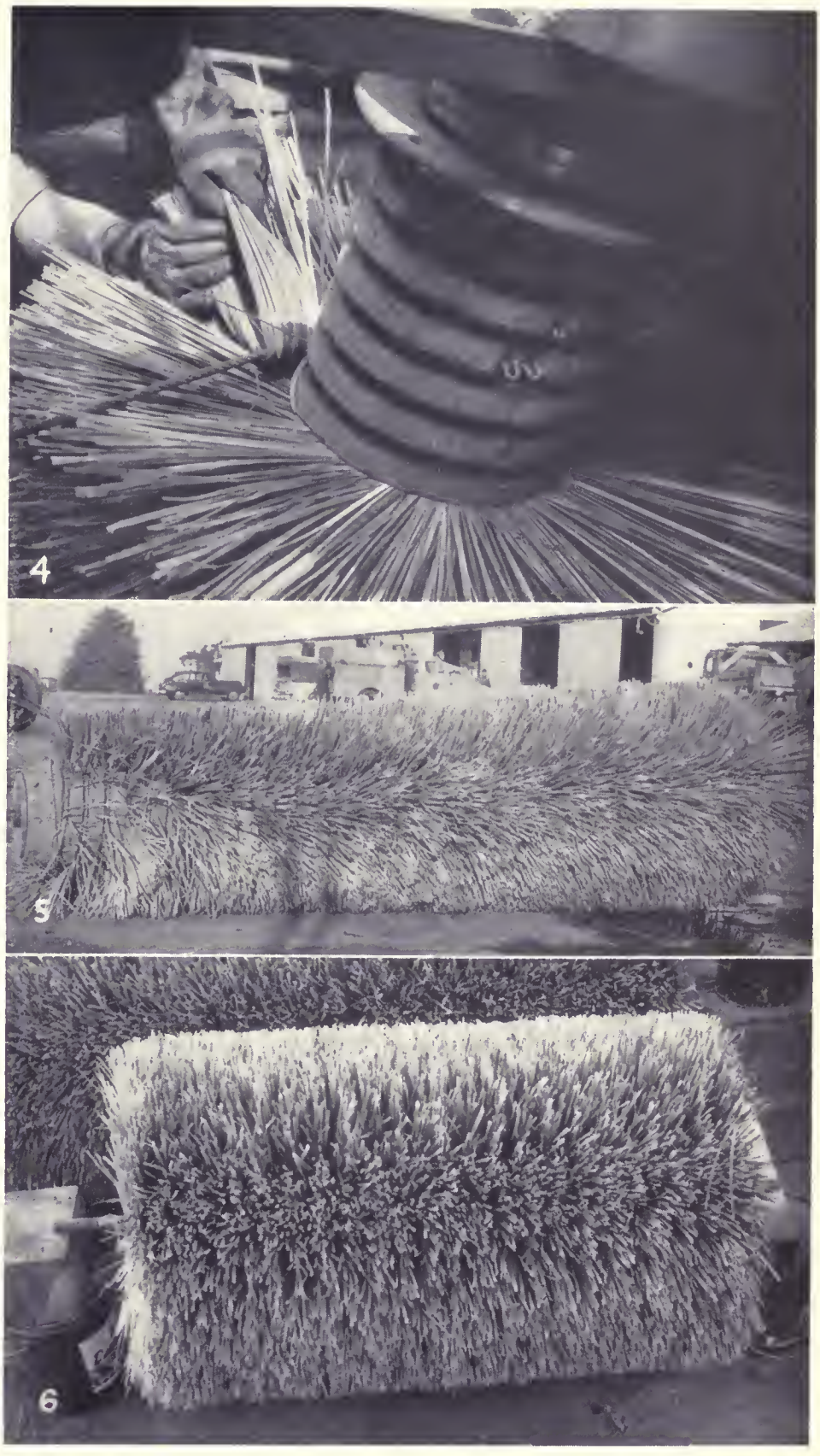
In substantiation of these observations, one of the brooms wound with half hickory and half palmyra swept 242 miles at a cost of $0.092 per mile for the fibre, including winding, on basis of the reported test data. This was the lowest cost per mile obtained on any of the brooms. A low average cost of $0.122 per mile was obtained on the complete series of tests made on this fibre. It was found that the City of Sacramento Street Department had also obtained successful results with palmyra and hickory fibres mixed and, in its opinion, these fibres proved the most satisfactory for their use of the fibres presently available.

CONCLUSION

Obviously, the results of this series of tests cannot be considered entirely conclusive, due to the many variable factors involved. Pressure exerted by the broom on the pavement, speed of broom rotation, roughness factor of the pavement swept and possible variation in inherent quality of the fibre are all important factors, variation in any one of which could be the basis for undue wear.

An analysis of the test data accumulated, together with an over-all picture of the results of the test series indicates that the most economic and thorough job of street sweeping which fulfills our normal requirements can be obtained by equipping our sweepers with broom cores wound with half hickory and half palmyra fibre intermixed.

On basis of the results obtained on this series of tests, the Maintenance Department of the Division of Highways is winding their sweeper broom cores with half hickory and half palmyra fibre whenever practicable. It is expected that our sweeping costs will be materially decreased and the efficiency of the brooms increased.



UPPER—Winding broom core. CENTER—Badly worn broom. LOWER—Completed broom ready for installation.

New Index

Highway Construction Costs Reach Record High Level

By RICHARD H. WILSON, Assistant State Highway Engineer
H. C. McCARTY, Office Engineer
R. R. NORTON, Assistant Office Engineer

DURING the fourth quarter of 1951 the California Highway Construction Cost Index rose 10.6 percent to reach an all-time high of 245.4 (1940=100). This fourth quarter rise confirms the statement made in October that the 6.9 percent drop in the third quarter was a temporary drop from a false peak and that the upward trend effective since the beginning of 1950 would continue during the fourth quarter of 1951.

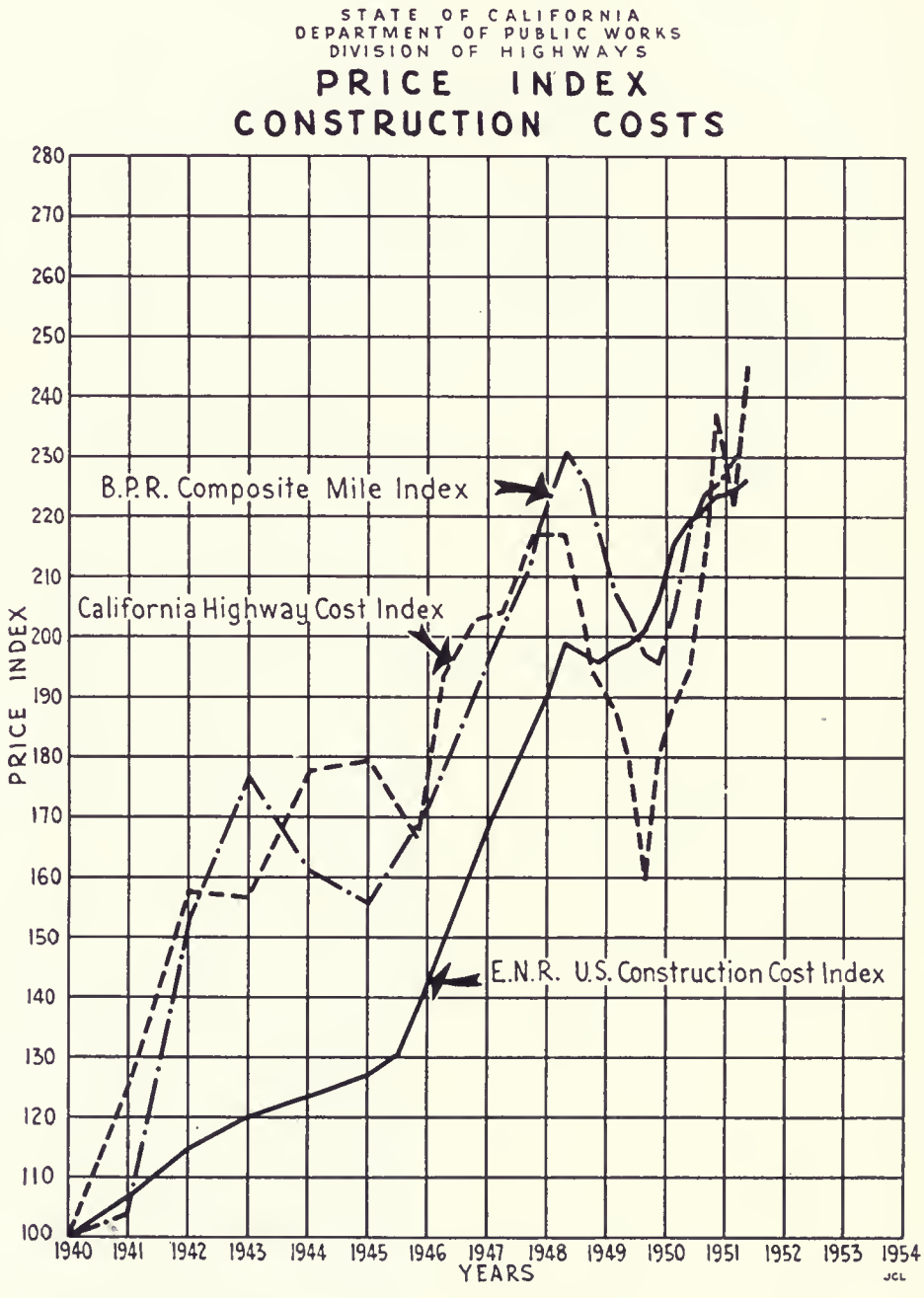
Beginning with 1940 as a base of 100 the California Highway Construction Cost Index shows the cost of highway construction rising steadily to 1948 when the index reached 216.6. This was a rise of 116.6 percent during those eight years. During the next two years costs declined; the index for the first quarter of 1950 was 160.0, a drop of 26.1 percent during those two years.

With the accelerated national defense program and the outbreak of the Korean war, highway construction costs began to rise in the second quarter of 1950, the index reaching 238.3 in the second quarter of 1951, an increase of 48.9 percent over the 160.0 low in the first quarter of 1950.

Upward Spiral

As previously stated, the third quarter of 1951 showed a drop of 6.9 percent, but the fourth quarter figure indicates that costs are back on the upward spiral, the index of 245.4 being 53.4 percent over the 160.0 low of the first quarter of 1950.

The U. S. Construction Cost Index of the *Engineering News-Record* rose 0.8 of 1 percent during the fourth quarter of 1951, which is a slight increase in the rate of rise of this index over the two previous quarters. Cost figures of the Bureau of Public Roads Composite Mile Index for the fourth quarter are not available at this writing,



but as that index rose nearly 6 percent during the first three quarters of the year it is thought that under current conditions its upward trend undoubtedly has continued during the last quarter of 1951.

The accompanying chart shows a comparison of the three indexes, all

with a base of 1940=100. Average contract prices for the items from which the California Index is prepared are shown in the accompanying tabulation.

Inflationary Tendencies

As long as inflationary tendencies continue, with the cost of living and taxes still on the increase, and while the short supply of steel and other essential materials with attendent uncertainties and delays persists, there appears no possibility of any drop in highway construction costs.

Our statement in the report for the third quarter of 1951, that the greater rate of rise of the California Highway Construction Cost Index over comparable indexes is influenced by local conditions, still holds as federal construction programs get under way for the Army, Navy and Air Force. This defense construction totals some 467 million dollars in California.

Considering these various economic factors of rising costs generally, limited supply and uncertainties of steel and other materials, and the large defense construction programs, it appears that the rise of highway construction costs in California will continue for some months.

Cost Index Tabulation

Following is a tabulation of the California Construction Cost Index from 1940 to and through the fourth quarter of 1951.

Period	Index 1940=100	Change from previous period	Change from 1948	Change from 1st qtr. 1950
1940	100	———	———	———
1941	125.0	+25.0%	———	———
1942	157.5	+26.0%	———	———
1943	156.4	— 0.7%	———	———
1944	177.8	+13.7%	———	———
1945	179.5	+ 1.0%	———	———
1946	179.7	+ 0.1%	———	———
1947	203.3	+13.1%	———	———
1948	216.6	+ 6.5%	———	———
1949	190.7	—12.0%	———	———
1950 (1st qtr.)	160.0	—10.5%	—26.1%	———
1950 (2d qtr.)	180.0	+12.5%	—16.9%	+12.5%
1950 (3d qtr.)	189.2	+ 5.1%	—12.7%	+18.3%
1950 (4th qtr.)	194.8	+ 3.0%	—10.1%	+21.8%
1951 (1st qtr.)	215.4	+10.6%	— 0.6%	+34.6%
1951 (2d qtr.)	238.3	+10.6%	+10.0%	+48.9%
1951 (3d qtr.)	221.9	— 6.9%	+ 2.4%	+38.7%
1951 (4th qtr.)	245.4	+10.6%	+13.3%	+53.4%

CALIFORNIA DIVISION OF HIGHWAYS
AVERAGE CONTRACT PRICES

	Roadway excavation, per cu. yd.	Crusher run base, per ton	Plant-mix surfacing, per ton	Asphalt concrete pavement, per ton	PCC pavement, per cu. yd.	PCC structures, per cu. yd.	Bar reinforcing steel, per lb.	Structural steel, per lb.	
1940	$0.22	$1.54	$2.19	$2.97	$7.69	$18.33	$0.040	$0.083	All projects
1941	0.26	2.31	2.84	3.18	7.54	23.31	0.053	0.107	
1942	0.35	2.81	4.02	4.16	9.62	29.48	0.073	0.103	
1943	0.42	2.26	3.71	4.76	11.48	31.76	0.059	0.080	
1944	0.50	2.45	4.10	4.50	10.46	31.99	0.054	0.132	
1945	0.51	2.42	4.20	4.88	10.90	37.20	0.059	0.102	
1st Half, 1946	0.41	2.31	4.00	4.54	9.85	37.38	0.060	0.099	Federal aid projects only
2d Half, 1946	0.39	2.27	4.12	5.04	12.39	49.84	0.079	0.142	
1st Half, 1947	0.48	2.62	4.52	6.46	12.41	47.03	0.080	0.133	
2d Half, 1947	0.54	2.39	4.02	6.48	11.58	50.15	0.089	0.123	
1st Half, 1948	0.56	2.45	4.42	4.91	13.37	49.51	0.094	0.145	
2d Half, 1948	0.52	2.64	4.80	7.00	14.01	49.08	0.103	0.131	
1st Quarter, 1949	0.49	2.48	4.54	5.70	11.84	48.11	0.089	0.113	
2d Quarter, 1949	0.43	2.91	4.63	4.06	11.74	48.63	0.083	0.110	
3d Quarter, 1949	0.41	2.40	5.05	4.60	11.53	45.35	0.080	0.093	
4th Quarter, 1949	0.43	2.55	3.78	3.50	12.66	44.54	0.078	0.092	
1st Quarter, 1950	0.34	2.22	3.65	3.74	———	40.15	0.077	0.081	All projects
2d Quarter, 1950	0.40	2.13	4.48	3.74	10.86	43.03	0.080	0.105	
3d Quarter, 1950	0.41	2.32	4.25	5.50	10.91	44.34	0.093	0.131	
4th Quarter, 1950	0.42	2.81	4.64	4.61	12.55	43.18	0.098	0.120	
1st Quarter, 1951	0.45	3.07	4.06	5.22	11.71	46.38	0.103	0.206	
2d Quarter, 1951	0.63	3.88	4.56	4.63	12.93	51.50	0.105	0.166	
3d Quarter, 1951	0.56	2.88	4.59	3.90	12.41	46.14	0.107	0.165	
4th Quarter, 1951	0.66	2.91	5.66	4.89	12.71	49.38	0.105	0.169	

Municipal Job

Improvement of Cherry Avenue In City of Tulare Is Described

By BERNARD P. WESTKAMPER, City Engineer, City of Tulare

THE PURPOSE of this article, in describing this small job, is to illustrate how one small city is using the funds allocated for construction under the Collier-Burns Highway Act. It might be interesting to public works officials in other similar political jurisdictions to compare their work with ours. If parts of this article appear facetious it should only serve to emphasis the complete seriousness with which we attempted to secure a good job.

Cherry Avenue is important in our community because it provides direct access northward to the district hospital and passes by one of the principal elementary schools. The job consisted of paving 1,280 feet of street. The work included roadway excavation, untreated rock base, plant-mix surfacing, curb and gutter, extensions to a box culvert, extension of storm drain and miscellaneous items.

Design

The design was prepared by the city with advice of Division of Highways personnel. Before initiating the design a complete and thorough field survey was made of the site. To this we attribute the fact that we did not have to make any changes in the plans during construction. The size of the job did not justify a rigorous analysis of pavement thickness. The section selected, based on judgment and past experience, was 2½ inches of plant-mix; over 5½ inches of untreated rock base, over a subgrade compacted to 90 percent, as determined by the Field Method Compaction Test, for a depth of six inches.

The engineer of city and cooperative projects of the Division of Highways reviewed our plans and objected to two items:

1. The reinforcing steel in the extensions to the box culvert at an irrigation ditch did not conform to the Division of Highways standard culvert plan.

2. The pavement width was wider than normal for two lanes plus parking and not wide enough for four lanes plus parking.

We changed our detail on the box culvert extensions. However, we did feel that the State's design was too conservative. In regard to street widths, we were able to show mitigating circumstances which warranted acceptance of a nonstandard width.

After the plans were approved the city asked for bids. One bid was received and it was for $29,360.40. This was above the engineer's estimate and the amount allocated. Two alternatives were open to the city; ask for a new bid and ask for an additional allocation from the city's share of gas tax funds. The city did both. At the next bid opening three bids were received. The low bid was $26,350.70, by Wells and Fields Constructors of Visalia, to whom the contract was awarded. The difference between the bids received at the first and second bid openings was possibly due to a paving plant being moved into the immediate area and to wider dissemination of the information that Tulare was accepting bids on paving.

Construction

We originally planned to utilize inspection by state personnel supplemented by our own men. Due to circumstances beyond our control this was impossible. Employees of the Division of Highways inspected at the hot-plant and taught our men how to make compaction tests. All street inspection was taken care of by city forces.

Excavation to subgrade was consummated quickly. In spite of having relocated the water mains, prior to the start of the work, we still had several broken service pipes. The contractor managed to sell the excavated material in a neighboring town for about enough to pay for the cost of excavating and hauling. Compaction of the subgrade to 90 percent to a depth of six inches was secured without ripping up and relaying it. This was fortunate, considering the maze of gas and water pipes just below the surface. One small spot which was overwatered during compaction quivered like a gelatin dessert when stepped on. Another overwatered spot was caused by a resident along the street watering his lawn and forgetting about it, thereby running the water all night and into the street.

Curbs and Gutters

Curb and gutter was constructed in conventional fashion. The concrete subcontractor started off with five-sack concrete whereas the specifications required six sacks of Portland cement per cubic yard. Of course this was instantly corrected. Curb forms were checked for elevation with an engineer's level at intervals of about 12 feet. This was in addition to setting grade stakes. During and after a recent rain there were no puddles in the gutter, in spite of the fact that part of the gutters were on a grade of about .0021.

The principal difficulty with the extensions to the 2-foot by 8-foot box culvert was in obtaining the four tons of reinforcing steel. Priorities had just come into effect.

There was considerable contrast between the reinforcing in the existing structure and the new extensions. The old culvert was reinforced with one-inch strap iron about 12 inches on center both ways. We hazarded a guess that it was excess tire iron stock left over when horse-drawn buggies went out of style.

The rock base and plant-mix was laid over the culvert to avoid the bump sometimes found when asphalt paving joins a structure. The contractor elected to backfill around the extensions with sand.

Untreated rock base was spread with a spreader box and a motor grader and compacted with a rubber-tired roller and a steel-wheel roller. Grade was checked against blue tops set at 50-foot intervals at the quarter points and center line. A penetration shot of one-fourth gallon per square yard of SC2 was placed on the rock base after compaction. It was two weeks later that we laid the plant mix. In the meantime we kept traffic off the street. As a consequence the SC2 penetrated a little over three-eighths inch setting up the base surface reasonably firm.

course, laid by means of a finishing machine adjacent to the gutters. The compacted surface next to the gutter was laid one-fourth inch higher than the gutter lip. Paving proceeded toward the center line. The last strip down the center was laid between two other strips. The contractor was careful on the width of his spreads so that the last one fit in the remaining space without too much difficulty.

The city had, in the past, some trouble with uncompacted joints. On this job emphasis was placed on obtaining good joints. One inspector

and paving was done over them. They were then raised to the pavement surface and patched around. This avoided the depressions and bumps sometimes found when manhole covers, etc., do not conform to finished grade.

There is one thing we may do different on the next job. That is, use one-half-inch maximum aggregate in the plant-mix instead of three-fourths inch. It might give a smoother textured surface, more suitable for a city street. However, they all look somewhat alike after they have been in use a year.



Cherry Avenue in City of Tulare after improvement

State Cooperation

The Division of Highways was completing a large project in our vicinity. Its contractors' plant production was available to our contractor as long as it did not interfere with state operations. Through the courtesy of the resident engineer, plant inspection was done by state personnel. Fortunately, the plant-mix used on the state project was made with the same grade of paving asphalt and the same gradation of aggregate as had been written into our specifications.

The plant-mix leveling course was laid with a motor grader. The contractor elected to start the finish

stayed just behind the paving machine with a straight edge and rule and measured the height of the uncompacted plant-mix at the joint above the adjacent compacted strip. He signaled the screed operator if it was starting to get too high or too low. Maybe this helped because we do not have a poor joint on the street.

Some of the asphalt rakers could not understand English too well. Fortunately our principal engineering assistants speak Spanish fluently. As a consequence, the raking was well conducted.

The tops of manholes and valve boxes were lowered prior to paving

The characteristics of the street that is particularly pleasing to us is the drainage. During recent rains, no puddles formed. The water ran off the pavement to the gutters and then to the catchbasins leaving a dry nonskid surface.

Acknowledgements

The city is grateful to the personnel of District VI of the Division of Highways for aiding us on this project and particularly to the engineer of city and cooperative projects.

Dr. Thomas Drilling is Mayor and Robert E. Rounsaville is City Manager. The work was done under the writer's immediate supervision.

TRAFFIC ENGINEERING AND HIGHWAY PLANNING

By GEORGE M. WEBB, Acting Traffic Engineer, Division of Highways

"GET THE FACTS," a good slogan in any walk of life, is an indispensable creed for the highway planning engineer. He must predict future highway needs, and future development bearing on those needs. Fortunately, he is not restricted to the crystal ball as the basis for his predictions; he can make estimates, not guesses.

The data which must be studied and analyzed by the planning engineer in projecting the highway program far into the future come from many sources. Among the most important are those which tell the traffic and accident story. In fact, since the purpose of all highways is to provide for the safe and expeditious movement of vehicles, a complete traffic picture is one of the foundation stones of the sound planning which must precede sound highway improvements.

Traffic Data Required

Obviously, if a highway is to be located and designed so as to accomplish its purpose efficiently, the planning engineer must have at his disposal a good deal of information about the volume of traffic, both present and future: about the behavior of that traffic under various conditions; about where the traffic is going; about the accident situation, including type as well as frequency; and about the probable accident rate on the various types of highway improvements which are under consideration.

An incidental but important benefit gleaned from a study of traffic volume and trends is an estimate of the probable available revenue for highway purposes. A reliable estimate of future traffic will naturally indicate the volume of taxable motor fuel consumed.

How is all this information accumulated? From many sources, and in many ways.

Annual Traffic Counts

The cornerstone of the informational structure is the traffic count. We owe a great deal to the "get the facts" philosophy of our early-day highway engineers, who initiated the first traffic counts on a few mountain roads back in 1913.

At present, more than a thousand traffic counts are taken throughout California on a Sunday and Monday in mid-July. The tally starts at 6 a.m. and ends at 10 p.m. on both days, a total of 16 hours for each day. Actually, most counts represent two or three, since they are located at intersections, and each leg of the intersection is tallied.

In addition to the basic annual count, the Division of Highways takes other traffic counts to show the monthly variation in traffic throughout the year and the daily variation throughout the week. At 87 of the regular annual stations, a monthly count is taken. At 18 of them a count is taken for seven successive days in July.

How Traffic Is Estimated

Finally, when the annual mid-July count is taken state-wide, the Monday count at the 87 "monthly" stations is made not for 16, but for a full 24 hours (6 a.m. Monday to 6 a.m. Tuesday, to avoid Sunday night traffic). These 24-hour counts provide the mathematical factors which enable the traffic engineer to expand monthly counts and other 16-hour counts into 24-hour figures. Further computations, using all these counts, can convert the July Sunday-Monday tallies to the average daily traffic at any given point on the State Highway System. In special situations, a count can be taken at any time of the year and can be accurately expressed, through proper application of various factors and formulae, in terms of average daily traffic.

One purpose often served by a special traffic count is to indicate the need for improvements at intersections. In such cases, the count includes a record of turning movements and their volumes.

Standard Project Report

Another primary source of information on traffic conditions which the highway planner must consider is the traffic section of the standard Project Report compiled by the field offices of the Division of Highways prior to the design and construction of any major highway improvement.

The Project Report always includes, in considerable detail, not only such information as the average daily traffic on the existing facility, but also data on the composition of that traffic, on its speed, and on the turning movements at all intersections which may require special treatment. This information, taken in conjunction with economic studies of the area concerned and reviewed in the light of the past development of the area and its traffic provides the basis for an estimate of future traffic, generally projected 20 years ahead.

The Project Report also contains the accident history of the existing facility, by type as well as rate. The probable effect on accident rates of the proposed improvement is fully discussed.

Another type of information needed by the planning engineer is the answer to the question: "Where is the traffic going?" Just as the simplest way to find out how many cars are using a given road at a given point is to count them, the simplest way to find out where people are headed in their vehicles is to ask them. We "get the facts" under this heading through an Origin and Destination Survey.

Origin and Destination

An Origin and Destination Survey can be complicated and expensive, or it can be quite simple. The two large-scale ones we have made thus far, one in the San Francisco Bay area and one in Sacramento, have involved interviewing a predetermined percentage of residents in their homes to learn the number, origin and destination of their trips for a day. The simple type of survey is the roadside interview type: it can be accomplished in a day or two, since it is based principally on the two

. . . Continued on page 60

Orinda Slide

Installation of 95 Horizontal Drains Was Monumental Project

By E. W. HERLINGER, Associate Highway Engineer, District IV, and
GIFFORD STAFFORD, Assistant Highway Engineer, Materials and Research Department

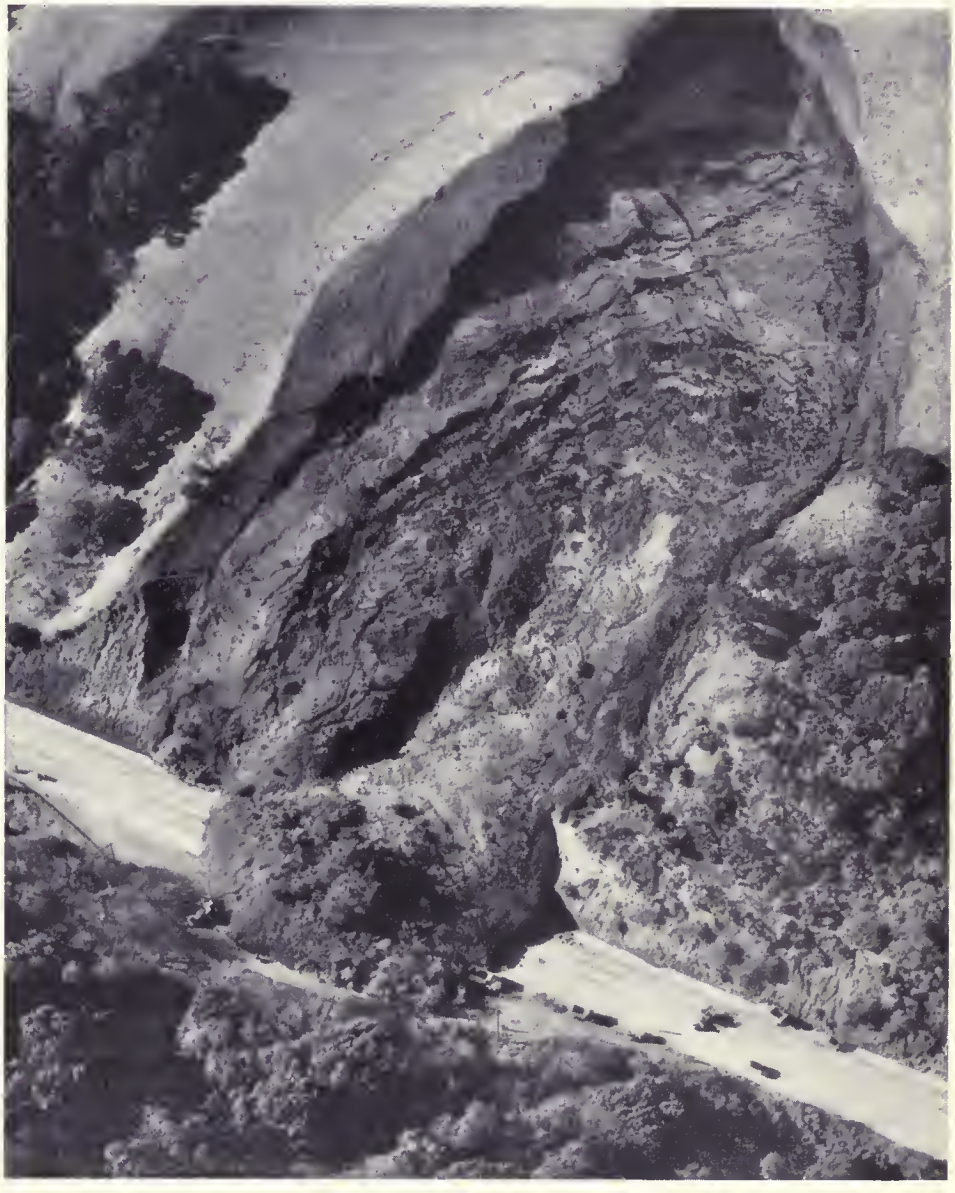
This is the story of the Orinda slide on the Tunnel Road, State Highway 75, situated 1½ miles east of the Broadway Low Level Tunnel in Contra Costa County, and of the methods adopted to stabilize it against a repetition.

An old slide again became active on December 9, 1950, after several days of heavy rainfall. A huge mass of earth, 300 feet wide which extended up the hillside for 800 feet, together with its cover of trees and shrubs, started to flow across the highway at about 10.30 in the morning. Within 15 minutes the gradual movement of the slide had caused complete obstruction of the four-lane pavement and the flow continued on a diminishing scale for approximately two hours.

A major slide occurred at the same location during the reconstruction of this road 15 years ago, at which time a 30-foot high cutbank was removed on the south side of the road to provide a detour. When the more recent slide came to rest, the roadway was buried for a depth of 30 feet at centerline and the daylighted area also was completely covered.

Slide Congests Traffic

The closing of Tunnel Road immediately caused serious congestion of traffic on both sides of the slide. There are four alternate routes that may be used by traffic from the Bay area to Contra Costa County. The main detour required vehicles to be rerouted northerly to Richmond and thence over a narrow and winding two-lane county road known as San Pablo Dam Road, to Orinda. Other alternate routes which were pressed into service required traffic to travel to Berkeley and thence via Wildcat Canyon Road to Orinda, via the Redwood Canyon Road to Moraga and thence to Orinda, or south to Hayward and thence via Crow Canyon and State Highway Route 107.



Aerial photagraph of Orinda Slide graphically shows its size. San Francisca Examiner photo.

The detour over the San Pablo Dam Road involved an increased distance of 15 miles while the remaining routes added as much as 25 miles to trips from the Bay area into Contra Costa County. Because of the distance involved and the circuitous routes, it was necessary to place over 200 detour signs.

Members of the Oakland Police Department, supplemented by officers from adjacent East Bay cities, worked for four hours to unsnarl the traffic jam that resulted from the closing of the road. The task of directing traffic to detours through the unincorporated

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Ridge Route

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Last Section Under Contract

The last section of this freeway between Los Angeles and Bakersfield is now under contract to the Claude Fisher Company of Los Angeles. Extending from the Los Angeles City limits at Tunnel Station for a distance of slightly over five miles to Pico Canyon Road, this contract calls for the widening and realignment of the roadbed, lengthening of existing culverts and the installing of additional drainage structures.

The two roadways, separated by varying widths of division strips, are being paved over cement treated subgrade with eight-inch concrete, 24 feet in width. The pavement is to be lined with plant-mixed shoulders eight feet wide on the right and five feet wide on the left. The widening and realignment of the roadbed through Weldon Canyon involves roadway excavation amounting to over 700,000 cubic yards, most of which has been completed. Paving is now in progress as weather permits. This contract will be completed in the late Spring of 1952 at a cost of approximately $1,000,000.

When the Claude Fisher contract is completed, the 45-mile length of the Ridge Route in District VII between Tunnel Station and the City of Los Angeles and the Los Angeles-Kern County line, will be completed for its entire length as a 4-lane divided limited access freeway. A very important portion of the construction in District VII, in the vicinity of Gorman and Tejon Summit, was carried out under a contract supervised by District VI forces.



Aerial view of construction of divided highwoy in Weldon Canyon section of Ridge Route

Concerning this contract, which also comprised a considerable length of reconstruction in Kern County, in the vicinity of Lebec, a story appears elsewhere in this issue of *California Highways and Public Works.*

Santa Ana Freeway

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latter part of October, 1952. At the present time this work is approximately 20 percent complete.

Third Contract

The third contract, VII-LA-166-A, 52-7VC17-F, carries the work to 0.2 miles beyond Lakewood Boulevard. The grading consists almost wholly of imported borrow for the embankments not previously constructed under contract 51-7VC17-F. The freeway is carried over Slauson Avenue and the Pacific Electric Railway on a reinforced concrete box girder overhead. A reinforced concrete and structural steel bridge about 635 feet in length carries the six-lane divided freeway across the Rio Hondo. Reinforced concrete is used for the Paramount Boulevard Undercrossing and for the Lakewood Boulevard Separation Structure. Portland Cement pavement is to be placed along with appurtenant storm drains, sewers, and a pedestrian undercrossing at Manzanar Avenue.

The third contract carries an allotment of $2,701,000 and is now about 10 percent completed. The contractor started work on August 20, 1951, and completion is scheduled for February, 1953.

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UPPER—Construction operations in Weldon Canyon section of Ridge Route, showing traffic being carried through construction on existing pavement. LOWER—Heavy equipment at work on construction in Weldon Canyon. Photo by Caterpillar Tractor Co.

STATE LOSES FOUR MAINTENANCE SUPERINTENDENTS

AMONG the more than 8,000 employees of the Division of Highways, no group has a more important role to play, year in and year out, than the superintendents in charge of the 61 maintenance territories into which the State Highway System is divided.

This winter the State lost the services of four of these key men through retirement. While other capable men have stepped up from the ranks of foremen, there is no ready replacement for the aggregate of nearly 120 years of state highway experience which these four men represent or for their accumulated maintenance "know-how."



LEWIS W. SEYMOUR

Although he served briefly as a laborer in the old Sacramento headquarters shop of the Division of Highways in 1917, Lewis W. Seymour's actual career in highway work dates from May, 1919, when he joined the Division staff upon his discharge from World War I Army service. He worked as timekeeper in District III for several years.

In 1925 Mr. Seymour was appointed foreman, and was advanced to superintendent in April, 1931. In September, 1933, he was transferred to District VI, and made his headquarters at Hanford.

In 1942 Mr. Seymour was assigned to the Taft territory, and served as superintendent there until his retirement on January 1, 1952, after more than 31 years of service on the State Highway System.



CARL A. MILLER

Coming to California in 1907 from Kansas City, Missouri, where he was born June 14, 1888, Carl A. Miller held various lumber mill and bridge construction jobs and worked intermittently for the Division of Highways beginning in 1917. He entered state service on a regular basis in July, 1921, when he was employed as a foreman at Willits.

In March, 1924, Mr. Miller was promoted to superintendent and was assigned to the northern part of Humboldt County. He resigned from state employ in 1925, but returned in September, 1927, as superintendent in the southern part of District I, with headquarters eventually located at Garberville.

Mr. Miller continued as superintendent at Garberville until his retirement on December 4, 1951.



KENNETH MENDENHALL

After extensive experience in road construction work in Southern California, Kenneth Mendenhall, born in Los Angeles, June 13, 1884, joined the staff of District V, Division of Highways, in December, 1922, as sub-foreman.

Mr. Mendenhall was advanced to foreman in May, 1923, and served in the Santa Maria area. When the position of superintendent for the territory covering Santa Barbara County and the southern part of San Luis Obispo County was established in February, 1929, he was promoted to that post.

Mr. Mendenhall retired on January 1, 1952, after 29 years of continuous service in the Santa Maria area.



ROBERT L. HOLLIS

Born May 30, 1885, in Mitchell, South Dakota, Robert L. Hollis came to work for the Division of Highways as a laborer in the Chico area on May 28, 1924.

He was promoted to sub-foreman on May 1, 1926, and became a foreman on September 1, 1927.

On June 1, 1935, Mr. Hollis was advanced to Highway Superintendent and was assigned to the Alturas territory. In November, 1938, he was transferred to Susanville, and on December 16, 1941, to the Chico territory. He remained there until he relinquished his post on December 1, 1951.

Ramona Freeway

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will cost approximately $5,850,000 and will add 4.1 miles to the existing freeway, will draw considerable traffic from Valley Boulevard in Alhambra, Garvey Avenue in Monterey Park, and other heavily traveled streets and highways. This will alleviate the peak hour congestion on these arterials with a resultant time saving for motorists traveling between the Metropolitan Los Angeles area and the many communities to the east.

Engineering Organization

In order to make the most efficient use of engineering personnel the organization as indicated on the accompanying chart has been developed. This relieves the resident engineer of a multitude of minor details and allows him to devote more time to matters of policy, public relations, major problems, right of way obligations, and discussions with utility companies and city officials regarding their problems during construction operations. It also provides the three general assistants, who are all potential associate highway engineers, an opportunity to gain valuable experience in supervising the work as a whole. The various other assistants on the jobs are transferred temporarily between the contracts as required, which results in more efficient use of the engineering personnel and broader experience for the men themselves.

The office work for the three contracts is handled from one field office by two field office engineers. This results in the elimination of duplicated effort.

Work of Survey Parties

Due to the complexity of freeway projects the services of survey parties are required for a large portion of the contract time. To make the best possible use of the parties while on the job, all survey work is coordinated through the field office engineers who keep priority lists of staking requirements. All requests for staking or other survey work, whether requested by the contractor or by state personnel, are made through E. L. Thompson, field office engineer, who being a former Chief of Survey Party is well qualified to coordinate this work.

The Bridge Department representatives, under the resident engineer for general administrative purposes, conduct their operations as independently as the mechanics of job control will permit.

With the job organization set-up that has been developed we find that the responsibilities of members of the engineering staff have been clarified, that duplication of effort has been eliminated, and that the various construction activities are coordinated and controlled for maximum efficiency.

Highway Division Is Commended by Road Commissioner

Commendation for the efficient job the Division of Highways has done in administering the Controlled Materials Plan is contained in a letter received by State Highway Engineer George T. McCoy from Sam R. Kennedy, Road Commissioner for the County of Los Angeles. Mr. Kennedy wrote:

"On behalf of the Road Department, County of Los Angeles, I would like to express our appreciation for the very commendable job that the State Division of Highways has performed in administering the Controlled Materials Plan. The efficient manner in which your organization has handled this complex and burdensome field of governmental controls reflects with merit upon those individuals who have administered this program.

"Mr. M. Harris, Engineer of Service and Supply, and Mr. R. H. Fulton, Assistant Engineer of Service and Supply, of your Sacramento office and Mr. R. W. Anderson, District VII Priorities Engineer have been particularly helpful and extremely capable in assisting and advising the Road Department of the County of Los Angeles in the various priority problems which have confronted us. It is my opinion that their excellent cooperation and direction has minimized the delay and confusion inherent in the inauguration of such a controlled program."

NICE CHRISTMAS GIFTS

Christmas gifts in the form of $50 checks from the State Merit Award Board were presented to William L. Van Sherman and Angelo A. Venturini of the Division of Highways by Director of Public Works Frank B. Durkee and Assistant State Highway Engineer Richard H. Wilson. Van Sherman and Venturini were awarded certificates of merit and the checks for inventing a rack for removing and replacing venetian blinds which will effect a considerable annual saving to the State.

Orinda Slide

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areas to the east of the slide was handled by the California Highway Patrol.

Heavily Traveled Highway

The construction of the Broadway Low Level Tunnel, together with the accompanying improvement of the tunnel road, provided the main artery for travel through the barrier formed by the range of Berkeley hills between Alameda and Contra Costa Counties. The opening through the barrier resulted in a rapid development of the central portion of Contra Costa County into a residential area, and the tunnel road has subsequently become one of the Bay region's most heavily traveled four-lane highways. The 1951 annual traffic count indicates a 24-hour Monday volume of 35,000 vehicles with an increase of 7,000 vehicles over the preceding year.

A major volume of this traffic represents commuter traffic, with 44 percent of the total volume occurring between the hours of 7 a.m. to 10 a.m. and from 4 p.m. to 7 p.m. A recent survey of the Walnut Creek-Pleasant Hill district indicated that more than 55 percent of the workers living in the area commuted daily to jobs in San Francisco or the East Bay. As the highway provides the only direct route of transportation between the two areas, immediate relief was urged.

Detour Provided

While the seriousness of the situation was somewhat minimized by the fact that the slide had occurred on a Saturday morning, the first consideration was to promptly provide a reasonable detour for four lanes of traffic. The wet weather and large amount of moisture in the slide presented a difficult and uneconomical dirt moving problem with a serious hazard to traffic as well. The material in the slide was in such a liquid state that as it piled on the pavement the mass above caused material to move laterally across the roadway.

The loaf-shaped mound that was thus formed served as a strut that counteracted the downward thrust of the slide when a state of equilibrium was reached. The risk of disturbing the equilibrium of so large a mass of material by removing the volume of earth that would be required to clear the roadway was too great, as an additional movement of the slide could have readily caused as much as 100,000 to 200,000 cubic yards of material to slide. This condition dictated removing only the minimum quantity of material around the toe of the slide to provide a width of roadway sufficient for a four-lane detour and the necessary roadside drainage. State maintenance forces, supplemented by rented equipment, removed approximately 9,000 cubic yards of slide material to provide a bypass detour 50 feet in width and 600 feet in length on the following Sunday. The detour was surfaced on Sunday night and was opened to traffic at 5 a.m. on Monday in time to care for the commuter rush.



Drain at roadway level flowing 36,000 gallons per day

Horizontal Drains

The next phase of the work began on December 14, three days after the detour had been opened, when a drilling crew from the Materials and Research Department moved to the slide to start the installation of horizontal drains.

First consideration was given to draining the active portion of the slide

in order to arrest any further movement which might jeopardize the operation of the detour. It was also desired to drain the unstable mass in order to dry out the material to facilitate subsequent removal of the portion to be excavated.

The drilling crew was put on a seven-day work-week schedule for a short time and began installing drains on the western side of the slide at roadway level.

Fourteen drains for a total of some 2,000 lineal feet were completed during this first phase of the treatment. These drains were all placed at roadway level and below, and so located that they would form a part of the permanent installation. An aggregate maximum initial flow of 85,000 gallons per day was developed by these drains, attesting to their effectiveness.

Temporary Work

With these measures, the removal of the encroaching slide material and its overload was postponed until after the end of the rainy season, when the material could be handled more economically and without subjecting traffic to a hazard from mud on the surface that would result from working with wet material.

Preparations for the final correction immediately followed the temporary steps. A contour survey was made of the entire slide area and district laboratory forces started exploration of the area by sinking vertical holes with a one-inch soil tube. The investigation was subsequently supplemented with horizontal borings made by hydrauger equipment and five vertical wells were bored with a power drill at different levels in the central portion of the slide. Data concerning the soil conditions, together with ground water elevations and the depth of the loose broken slide material were obtained. The studies indicated that four and a half acres of ground, involving approximately 250,000 cubic yards, were involved in the movement.

The easterly half of the slide appeared to be a huge mud flow, while the westerly half was mainly composed of broken rock and shale. The test holes indicated a depth of from 30 to 50 feet of loose material in the slide area with an abundance of underground water. A record of ground water levels observed in these borings is being continued and will be helpful in determining the effectiveness of the slide treatment.



Slide after excavation, showing switchbacks on bench road

Unique Design

The plan adopted for the corrective treatment of the slide involved reducing the slope to an approximate 2:1 ratio and drying out the area of loose material by intercepting surface drainage and by providing subdrainage by means of horizontal borings at various levels. The problem of gaining access to the different levels of the slide where work was necessary was solved by a unique design which provided a 14-foot width of roadway on a 20 percent grade with three switchbacks. This layout provided dual purpose benches which served to collect surface water and afforded a location for the connecting pipes for the subsurface drainage system. In addition, the benches with the connecting switchbacks served as a haul road for materials and equipment and provided a working platform for the horizontal drilling equipment.

By April 1951, the slide material had dried out sufficiently to be handled

without difficulty. Material previously removed from the slide had filled all available dumping areas in the immediate vicinity and the nearest suitable disposal area was located on the San Pablo Dam Road at a distance of about one mile from the slide.

Traffic Problems

Since the slide was located on the northerly side of the highway it was decided to use the outer westbound traffic lane with the adjacent shoulder as a two-way haul road and westbound traffic was restricted to a single lane during hours that work was in progress. Conflict with traffic at the Orinda intersection was avoided by providing a section of temporary haul road that skirted the intersection for a short distance. Under normal conditions, the congestion at this location is acute during peak traffic hours, so in order to minimize the inconvenience and hazard to traffic, the work was performed by day labor and operations were scheduled during off-peak hours. Heavy traffic on the highway route and congested conditions at the signalized intersection a short distance to the east where the San Pablo Dam Road crosses the highway at Orinda complicated the haul problem.



Drains connected to collecting pipe in interceptor trench

The excavation operations included dressing down and removing loose and broken material which was overloading the slide; the system of benches and switchbacks previously described; a bulldozer trench approximately 200 feet long and 15 feet deep in the upper water bearing area to serve as an interceptor; and finally, the removal of the material that encroached upon the roadway.

When the excavation and construction work had reached the stage where the access and bench roads were passable, drilling work was started in the upper portion of the slide.

Collecting pipe and drains on lower bench



20 Drains Installed

The first drains in this area were located in the vicinity of a spring near the lower end of the interceptor trench. As soon as the trench was completed, drain installations were continued from its bottom. Large seepage areas appearing on the north side of the trench indicated a large amount of water entering the slide in this area.

Twenty drains were installed from the trench and vicinity. The seepage areas were dried up and a total initial flow from all 20 drains was over 200,000 gallons per day with one drain measuring 90,000 gallons per day, initial flow. Several of these drains were approximately 200 feet long; there was considerable difficulty in drilling and casing to such depth.

The drains installed from the trench were connected to an eight-inch perforated metal pipe covered with filter

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New Expressway

Another Unit of Coast Highway Open to Traffic Year in Advance

By GEORGE T. McCOY, Jr., District Construction Engineer

TRAFFIC between Chualar and Spence Underpass, in Monterey County, has been routed over a four-lane divided highway since November 30, 1951—more than a year ahead of previous scheduling. Work recently completed on the five-mile section south of Salinas was the first of a planned two-stage development which will result in an expressway to carry the heavy traffic volumes prevalent on this portion of the Coast Highway.

The first stage contract provided for the construction of new northbound lanes. It included provisions for placing base materials, Portland cement concrete pavement, and the temporary road approaches and crossovers required to provide access to adjacent properties. Shoulder construction was not provided, since it was not expected to be able to route traffic over the new lanes until the second stage of construction. Similarly, the transitions connecting the new lanes to the existing roadway were scheduled for construction as one of the first operations of the second stage contract.

More Work in Spring

Work to commence this spring under the second stage of the development provides for the shoulder and transition construction previously mentioned; routing traffic over the new work, followed by widening and reconstruction of the previously existing roadway, together with the permanent construction of crossovers, frontage roads, and road approaches to serve the local traffic. When completed, this project will provide the first section of highway south of Salinas in Monterey County constructed to expressway standards.

The northerly end of this expressway, Spence Underpass, is the point from which the Salinas Freeway will leave the existing highway to provide the modern highway service so urgently needed by the heavy traffic volumes common to this section. It is anticipated that work on the first unit of the Salinas project will start this spring and it is planned to proceed continuously on this project with succeeding units until it is completed.

Chualar to Spence Project

The two stages of the Chualar to Spence project were planned to dovetail so that construction would be virtually continuous, although carried out on two separate contracts. However, vigorous prosecution of the work by the first contractor made it apparent that he would finish far ahead of schedule. Rather than leave the newly completed northbound lanes idle and unconnected during the winter months, particularly when the additional lane capacity is so badly needed in this area, slight changes in scheduling were made and the highway placed in service on a divided four-lane basis.

The transitions to the existing road were advanced into the first stage contract, the shoulders were shaped and given a temporary treatment to retard erosion until surfaced on the second

Construction between Chualar and Spence Underpass on U. S. 101. Photo by Caterpillar Tractor Co.





Applying water to base material by means of power sprays to obtain a more uniform spread than is possible by gravity feed

stage contract. Traffic will be routed over a divided highway, except for the necessary period next summer when reconstruction of the existing lanes will force the use of the new lanes as a two-lane highway for the duration of the construction period.

Historical Background

The history of this section is of interest because it is typical of the Coast Highway through most of this area.

The first improvement occurred in 1916, when, under standards very progressive for that era, a Portland cement concrete pavement 15 feet wide and four inches thick was constructed. The next significant improvement took place in 1930 when asphalt concrete pavement 20 feet wide and four inches thick was placed over the existing surface. This basic roadbed with shoulder improvement and surface repair has survived until now, when major reconstruction is required.

The highway serves an area that is as densely farmed as any portion of the world, in addition to carrying a main stream of coastal traffic. The surrounding land is excellent from an agricultural viewpoint, but has very poor properties when asked to support heavy truck loads. The poor structural value of the soil is accented by the nearly complete irrigation program in the adjacent fields, which results in saturation of the native materials under the roadway. Traffic volumes of from ten to fifteen thousand vehicles per day, many of which are heavy trucks, require extensive base construction to support the surfacing over the poor quality native soils.

Farm Vehicles Slow Traffic

Another feature related to farming which has caused much congestion on highways in the vicinity, is the specially developed vehicles which haul the produce from the fields to the packing houses, from where it is shipped to market. These vehicles generally consist of a tractor unit pulling two trailers in tandem. The trailer wheels are of a narrow gauge, approximately four feet, to fit the rows in the field; the body is of maximum width to permit carrying as much produce as possible. These vehicles operate at speeds much lower than those of the main volume of traffic and, of course, contribute greatly to congestion on the highway. Needless to say, additional lane capacity is extremely im-

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Completed section of U. S. 101 between Chualar and Spence Underpass



Highway Deficiencies: How Defined—What Can Be Done

By J. W. VICKREY, Assistant State Highway Engineer

The following article is based on an address delivered by Mr. Vickrey before the recent annual meeting of the Highway Section, California State Chamber of Commerce, in Los Angeles.

THE TERM "deficiency" in its application to highways probably was used first, in California at least, in 1944. During that year the Senate Committee on State Highway Revenue of the State Legislature propounded a set of questions to the California Division of Highways, requesting pertinent information with regard to the physical condition, financial status, and other matters with regard to the State Highway System of California.

Included in this questionnaire was the question, "What are the critical deficiencies of the State Highway System at this time, and why are they critical?" The answer to this question required both a discussion and a definition of highway deficiencies. It is immediately apparent, therefore, that the subject is not new, but having been presented again for discussion, seven years later, it is equally apparent that it has not been satisfactorily answered.

Subject of Great Interest

As a matter of actual fact, this subject of "Highway Deficiencies—How to Define Them," and the setting forth of a bill of particulars under selected definitions, has been a subject of considerable interest throughout this Country during the last seven years. There has been much written about it and just as much, or probably more, said about it in speeches and papers presented before highway-minded groups. The discussions, however, have been in the most part concerned with what to do with the deficiencies after they were defined rather than with the definitions themselves.

Included in the questionnaire that was propounded to the Division of Highways in 1944, there was another question. It preceded the question about deficiencies. The Senate committee asked: "Of what economic importance to California is motor transport?"

The first information the committee wanted for consideration, therefore, was a factual statement of the part that the highway represents in the economic scheme of things. In other words, what is the job that highways have to do here in California? The answer that was made to that question at that time by the Division of Highways is, of course, a matter of record and need not be repeated here in full.

Function of Highways

It would appear to be desirable, however, to again consider for a moment just what function highways do perform in our economy of today. In order to discuss intelligently the deficiencies of highways generally, or a specific system of highways, common sense dictates that there must be an acceptable understanding of the reasons for having highways. What do we expect them to do? What function do we want them to perform?

Back in 1944, the Division of Highways in its report to the Senate committee said this, in part:

"Transportation is a fundamental thing. It is, in fact, a thing so basic to our whole scheme of living that by the degree of its development we can closely measure the progress of civilization itself. All forms of transportation by whatever medium—water, rail, air, pipe line—make important contributions; but of all methods employed, road transport has always been and continues to be man's primary means of movement and intercommunication. For short trips the road has no competition. Even where for longer movements some other medium may be found advantageous for some intermediate portion, the road is again called upon at one or both ends to finally complete the job. To this important extent the road has always been and still remains indispensable."

Record Registration

A few months ago a large tire and rubber company, in a full-page statement in California daily newspapers, said this:

"The United States has more motor vehicles than all of the other countries of the world. Two-thirds of all freight is shipped by truck. Three-fourths of all passenger travel between cities, towns and farms goes by car and bus. More than 40,000 communities are completely dependent on car, truck and bus transportation. Therefore, it is vital that the automotive vehicles, on which we so largely depend, be kept moving quickly, economically and safely."

And recently in the daily press there appeared this statement:

"New statistics compiled by the Automobile Manufacturers Association show that during an average week 73 percent of the Nation's private cars are used for traveling to and from work and 53 percent for shopping. (The sum of these two percentages reflects to some extent at least multiple car use.) Twenty-two million passenger cars are used each week for earning a living, 16,000,000 for shopping. Some 2,500,000 persons in the United States use cars daily in earning a living. Forty-five percent of all employed persons use a passenger car in connection with their work."

Let us then for the moment and for the purpose of this discussion, at least, assume that highways are very necessary to our mode of life. Let us at least say we need them to implement our way of life. Then, to what extent or to what degree are they fulfilling the purpose for which we want them? Are they entirely satisfactory, or not? Do they do what we want them to do? Do they do too much or too little?

And so, with that particular thought in mind, let me do a little more quoting from the experts. In a statement before the Senate Fact-Finding Committee on State Highway Revenue in Sacramento on October 4, 1944, the Director of Public Works, the late Mr. Charles H. Purcell, made this statement, in part:

What Mr. Purcell Said

"The first income from gasoline tax in California became available in the 1923-1924 Fiscal Year, and the last of the bond issue money was expended the following year. Beginning with those years, the income per mile of road and per registered car began to rise, and with the increased income from gasoline tax, beginning in 1927, the annual income for highways reached approximately $10 per registered vehicle, or, in terms of miles of road in the State Highway System at that time, slightly in excess of $3,000 per mile. This level of income was maintained for a short period of time. In 1933 the Legislature allocated one-quarter cent of gasoline tax to state highways within incorporated cities, and in 1935 another quarter cent was allocated to major city streets. At this same time (1933) the State Highway System was increased by some 6,000 miles. This extending of the system over which the funds were to be expended, both on rural roads and city streets, quite naturally reduced the funds available per mile of road, and likewise per registered vehicle using those roads.

Wider Traffic Lanes

"During the intervening years, because of the increase in traffic volumes and speeds, and the increase in truck traffic—both in quantity and size of vehicles—it has been necessary to provide wider traffic lanes generally throughout the system, multiple lanes over a considerable mileage, longer radius curves, and to a considerable degree lesser grades. It has also been necessary to provide in many instances grade separations, extensive channelization schemes, traffic signals, and other necessary improved facilities.

"Thus, during the last 10 or 12 years prior to the war, the cost to traffic service over this extended system had increased very materially per vehicle unit; and while there had been an increase in total gasoline tax and registration fees, there had been a gradual losing of ground insofar as over-all improvement of the entire highway system was concerned."

Population Increase

That statement was made in 1944. There have been large sums of money invested in highways in California since that statement was made, but during the same period of time there has been an extraordinary increase in population and in motor vehicle registration. Even with the added expenditures the improvement of the road system has not kept pace with the traffic increase, with the result that in the over-all improvement there has still been a losing of ground.

Public Awareness

I might quote at considerable length from other sources and from other authorities on the sufficiency of the highway system to carry the present traffic load. I might even read at random from the great mass of correspondence, petitions and resolutions from persons from all walks of life that daily flow through the office of the Division of Highways at Sacramento.

The public awareness of the problem is evidenced in the State Chamber of Commerce annual listing of highway needs, based on discussion at local public meetings arranged by that organization.

For example, in July, 1951, the California State Chamber of Commerce presented to the California Highway Commission a state-wide program for state highway construction and improvement for consideration in the preparation of the 1952-53 Fiscal Year budget. This program was spelled out job by job, section by section, and county by county, and represented the assembled findings of all California communities on what constituted the most urgent highway needs. It totaled in dollar cost one billion, six hundred million dollars.

It is a generally accepted fact, I believe, that the State Highway System is not adequate for today's traffic. It is not satisfactorily doing the job the public wants it to do. It is deficient.

How can that deficiency be defined?

Highway deficiencies can be and have been defined in the following terms. These terms have been used in every state that has made an extensive study of the problem. Exactly the same words have not been used in each instance, but the words that have been used in every instance mean the same thing in the final definition.

1. *Structural Soundness*

Roadbeds and bridges which are structurally inadequate for the type of traffic they are called upon to carry are doubly deficient. Such weaknesses tend to restrict or to altogether preclude travel at normal speed and the movement of legal loads. When this occurs the highway has failed in the fundamental purpose for which it was created. A second critical condition unavoidably results, for in the constant endeavor to keep all restrictions on traffic to a minimum, excessive maintenance expenditures year after year cannot be escaped. Relief from this can be had only through major action for the permanent cure of these weak roadbeds and bridges.

On the State Highway System there are many miles of highways and literally hundreds of bridges that are structurally deficient; many of the bridges are posted for less than legal loads. This is particularly true in the outlying areas where freight traffic has increased by leaps and bounds to get forest products, mineral products, and agricultural products to an ever increasing market.

2. *Traffic Capacity*

Experience has taught us that highways carrying over 5,000 vehicles a day, particularly where the peak

movement exceeds 600 vehicles per hour, should provide more than two traffic lanes. This is especially true if there is included in this traffic volume more than the average freight traffic. This inadequate traffic capacity, lack of space in which to operate, is the outstanding deficiency on the State Highway System today. It is more apparent in the metropolitan areas and on the main line highways.

Traffic Capacity Lack

But lack of traffic capacity also exists to a marked degree on many miles of two-lane highways, particularly where too narrow width occurs in conjunction with obsolete alignment that allows insufficient sight distance for the present day traffic. Many sections of the Redwood Highway and the Interstate Route up the Sacramento Canyon near Dunsmuir are good examples of what I mean. Donner Pass (US 40) is another.

Inadequate traffic capacity is not limited just to those roads carrying 5,000 or more vehicles daily; it also exists on many roads carrying somewhat lesser volumes.

But the figure of 5,000 will shortly become even more significant. In 1940 on the 12,500 miles of state highway outside incorporated cities, the average daily traffic was 1,800 vehicles. In 1950 it was in excess of 3,000, of which 18 percent were trucks. We estimate that within about 10 years it will be 5,000, and that is all too short a time to do what should be done in order to accommodate this traffic safely and expeditiously.

Traffic seems to increase inexorably and at a faster rate than population. Coupled with the metropolitan situation, the lack of capacity in the rural highway system thus presents an alarming problem; first of giving service, and second of giving it in safety. This matter of traveling safely brings us to our third consideration.

3. *Traffic Safety*

The nationally accepted measure of highway safety is traffic fatalities in terms of vehicle miles of travel. Taken as a whole, California in these terms has made outstanding progress. Back in the years before the war—say in 1938 or 1939—the record shows for California about 13 fatalities per 100,000,000 vehicle miles on all highways, roads and streets. Measured in the same terms today, the record is down to about seven. That is heartening news and, if lives were not at stake, a record of which we could be proud. But when lives are at stake—and they are in traffic today—we cannot point to the record with anything but sorrow and shame; what we must have is not only a decline in the rate but an actual decrease in the number of people killed.

Looking at this situation from the highway standpoint alone, regardless of any other consideration, experience has taught us that the only type of highway that will contribute materially to the solution of the traffic accident problem is the freeway—divided roadways, access control, and separated grades.

Three Categories

These three categories—structural soundness, traffic capacity, and traffic safety—taken separately or in combination, are the terms generally accepted nation-wide for the purpose of defining highway deficiencies; and they have been used by most all states that have inventoried their highway systems within the past few years.

This discussion would not be complete, however, without mention of another term that has come into recent use—the Sufficiency Rating.

The Sufficiency Rating is a procedure under which an arbitrary numerical value is assigned to each of these categories of deficiency, structural soundness, traffic capacity and traffic safety, just discussed, and then, using the total assigned numerical value as par and comparing each section of highway against its predetermined standard by means of weighted point values for each category, deriving a score for each section; and finally arranging the sections for the entire highway system in order of adjusted ratings. Such a system was initiated in Arizona by an engineer who is now employed by the California Division of Highways.

This system has since been used in several states, including Colorado, Connecticut, Delaware, Louisiana, Oregon, Washington and others, amounting to 12 or 13 in all.

Sufficiency Rating Formula

From a discussion of the subject with representatives of the states at a meeting of the American Association of State Highway Officials at Omaha last October, it appears that this system has been applied by the great majority of states on rural low-traffic roads only. It has not been used on metropolitan freeways.

A report of the Highway Research Board, published in June of this year, gives a rather complete review and digest of the Sufficiency Rating Formula and procedures, setting forth the purposes for its use, and enumerating both strong points and weak points. It is apparent from a review of this report that no high degree of uniformity exists in the application of the formula in the several states where it has been used, and that uniform results have not been obtained.

From the preliminary study that we have given this subject with regard to its application in California, we have concluded that:

(1) it cannot be effectively used without extensive analysis and study over a period of at least two to three years;

(2) that as now developed it cannot be applied to metropolitan freeways, particularly in connection with a determination of metropolitan needs as compared with rural needs; and

(3) that it may even be of little value in application to main line freeways outside of metropolitan areas.

Symposium on Airfield Pavements for Jets

The U. S. Naval Civil Engineering Research and Evaluation Laboratory of the Bureau of Yards and Docks is sponsoring a symposium on "Airfield Pavements For Jet Aircraft" to be held in Port Hueneme, California, on April 17-18, 1952.

The symposium is being held to encourage and facilitate the interchange of information and ideas among various groups engaged in research aimed toward the design or modernizing of airfield pavements to withstand the effects of jet powered aircraft.

New Expressway

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portant in this agricultural section to minimize the effect of these slow-moving vehicles, as well as to carry the normal heavy flow of vehicles present on this important artery.

The benefit derived from early completion of the first contract on the section amounts to six month's service from a modern expressway, as opposed to service on a congested two-lane highway.

The contractor on the work took full advantage of materials found in one of the sources set up for the job. The material in the pit varied from a silty topsoil to a very high quality decomposed granite. Three grades of material varying from imported borrow with no quality specification to imported base with a rigid specification were required to construct the fills and base. All three materials, totaling 230,000 tons, were taken from this one source. Careful selection of materials and timing of operations enabled him to supply materials well inside the specification for each type of material.

Another interesting feature of the work was the installation of a 90-inch field assembled plate culvert which will house a belt conveyor under the roadway, between the railroad spur and loading platform and the warehouse of the Eckhart Seed Company. This provision will eliminate the extensive trucking across the highway that occurs in connection with the seed company's operations.

Other significant quantities of work performed in the first stage contract include 1,600 linear feet of reinforced concrete pipe, 16,000 cubic yards of Portland cement concrete pavement, 70,000 square yards of mixing and compacting of cement treated subgrade, 3,200 barrels of Portland cement, and the 230,000 tons of imported base materials.

The work was very capably performed by the Fredrickson and Watson Construction Company, who were represented on the job by Mr. Bernard Fredrickson and A. L. Pace. Richard H. Roberts was the resident engineer on the project, representing E. J. L. Peterson, District Engineer, District V, Division of Highways.

IMPORTANT APPEAL COURT RULING

In a recent decision the District Court of Appeal in a unanimous opinion established the right of a city to contribute, and the right of the Department of Public Works to accept, city tax funds to assist in defraying the cost of projects for the improvement of state highways within cities.

The ruling was in the case of Dr. Eugene Perez of San Jose, owner of property fronting on The Alameda, who brought suit to enjoin the City of San Jose from expending $15,000 of city gas tax funds for street lighting on that section of US 101 in San Jose locally known as The Alameda. The trial court denied an injunction and dismissed the action, which Dr. Perez carried to the appellate court.

Applicable Statutes

Section 114 of the California Streets and Highways Code provides

"When the commission has allocated any funds for the construction, improvement or maintenance of any portion of a state highway within a city, the department may enter into a cooperative agreement with such city for the performance of any such work by the department or by such city, or for the apportionment of the expense of such work between the department and such city."

Section 113 of the code provides in part

"Any * * * city may aid in the construction, improvement or maintenance of any state highway within its boundaries by contributing any part of the expense thereof to the department out of any city funds available or to become available for construction, improvement or maintenance of streets within the city."

State and City Agreement

Pursuant to the authority of these sections, the California Department of Public Works and the City of San Jose, during the year 1947, entered into a cooperative agreement relating to the maintenance and improvement of state highways lying within the boundaries of San Jose, and providing for the performance of certain work by or under the supervision of the State and city, respectively. Among the projects covered by the terms of the agreement was one for the construction by the city of a center dividing strip, and the installation of certain traffic signals and street lighting, on State Route 2, which is locally known as The Alameda. The funds to be used for this project were primarily the city's allocated share of State gas tax funds earmarked for expenditure on State highways within cities, but since under Section 195 of the code, and under the department's previous policy, State gas tax funds cannot be used for street lighting other than safety lighting, the city agreed to contribute out of city funds the estimated cost of the street lighting, which was $15,000.

Lower Court Denies Injunction

Dr. Perez, a resident of San Jose and the owner of property fronting on The Alameda, brought suit to enjoin the city from expending city tax funds on this project, on several grounds. Because of the State's interest in the completion of the project and the settling of the legal points involved, the Department of Public Works intervened in the lawsuit, and presented its views to the trial court, as did, of course, the plaintiff and the city, in the hearing on plaintiff's application for a preliminary injunction. After hearing, the trial court denied the injunction and dismissed the action.

On the appeal, which was argued in the District Court of Appeal on October 22, 1951, the only points raised by the appellant, Dr. Perez, were:

First, that the improvement of a state highway within the city was not a municipal purpose within the meaning of certain provisions of the State Constitution which have been interpreted as prohibiting the expenditure of municipal funds for other than municipal purposes; and second, that in enacting Section 113 and other sections of the Streets and Highways Code, the Legislature intended to prohibit cities from using, in the improvement of state highways within their

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Orinda Slide

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material to serve as an underdrain. This pipe also served in the collection of surface run-off during storms, as well as a collecting pipe to carry the horizontal drain water out of the slide area. During the dry summer months the flow in this collecting pipe tapered off to a flow of approximately 7,000 gallons per day, but has increased to 85,000 gallons per day at this writing which is in the middle of the wet season.

After completing the installation from the trench an attempt was made to install drains at the extreme upper portion of the slide. Due to the extremely broken condition of the formation, this proved impracticable and was discontinued; as a similar condition existed at the upper bench no drains were attempted at this level.

Drains Successful

Installation work was then begun in the main portion of the slide from the middle and lower benches formed by the access road. These drains appear to be quite successful, particularly those from the lower bench which developed a total initial flow of some 50,000 gallons per day, decreasing to about 3,000 gallons per day during the dry season; the rainfall in this locality during the last three months exceeded 20 inches, and the flow has increased to 40,000 gallons per day.

The installation of the horizontal drains was followed by construction of a system of collecting pipes and paved gutters that were constructed on the benches. The pipes serve to collect the water flowing from the drains and prevent its percolation into the slide mass. The paved gutters serve to catch the surface water during storms and minimize erosion by surface run-off. Both are designed to carry all the water that can be collected out of the slide area.

The excavation operations in connection with removal of the overload from the slide and the material encroaching upon the roadway continued for three months and a total quantity of 62,000 cubic yards of material was removed during this phase of the work. After the original roadway was restored, installation of horizontal drains was resumed at the roadway level. Drains were placed at locations which had been inaccessible to the drilling crew during the slide removal operation.



Vertical drilling equipment at Materials and Research Department

Largest Project of Kind

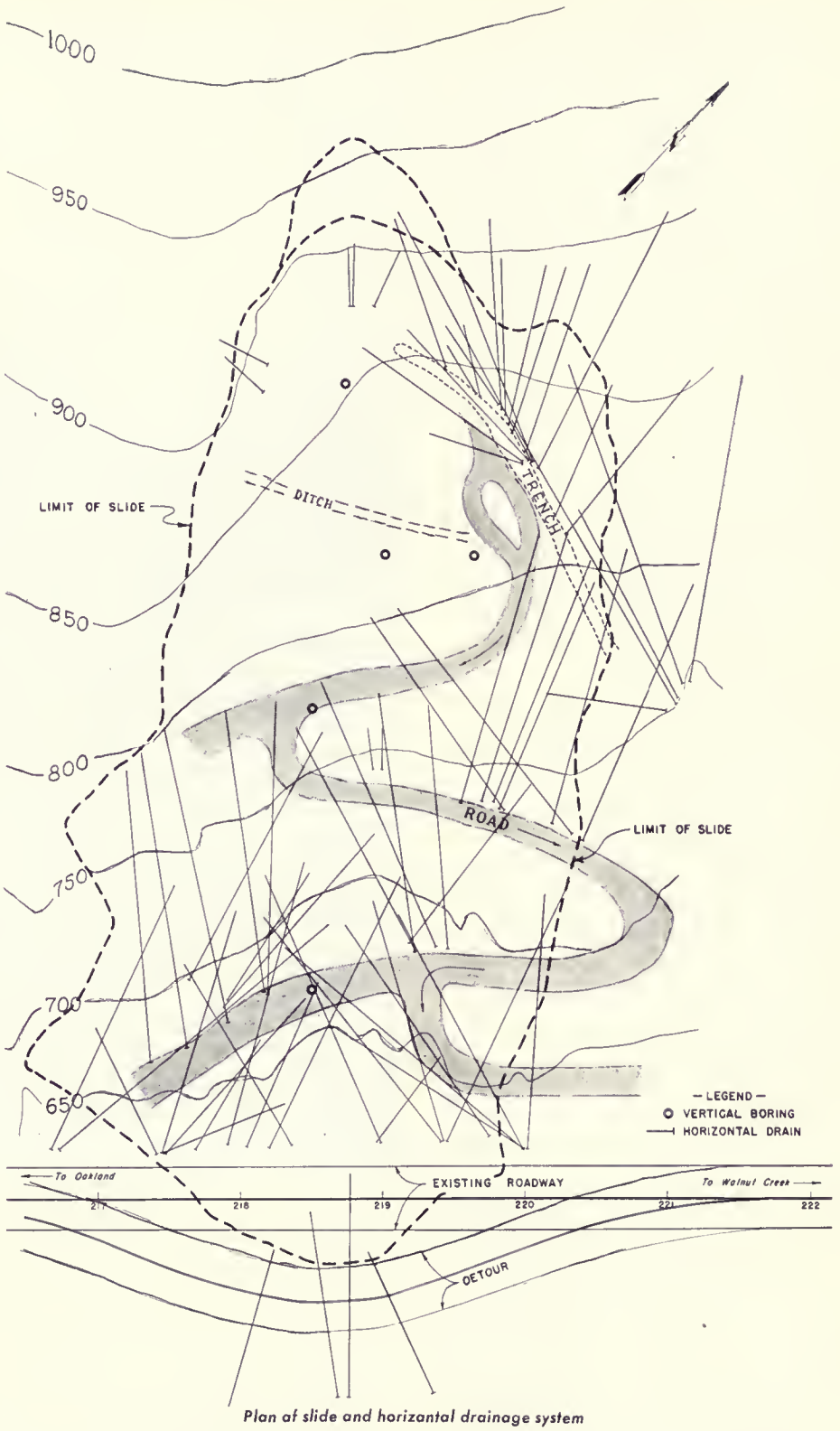
This installation of horizontal drains to aid in the stabilization of a slide area is the largest single project of its kind that has been undertaken to date by the Division of Highways. To date, a total of 95 horizontal drains has been installed for an aggregate length of 10,000 lineal feet of drain in 11,700 lineal feet of drilled hole. A total flow of 135,000 gallons per day is being recorded during the present rainy season from this horizontal drainage installation. The installation of drains is being continued and it is contemplated that this work will be completed early this year.

The drilling of holes and installation of horizontal drains as well as the work of making the exploratory borings and vertical wells was performed by personnel of the Materials and Research Department. These items represented

approximately one half of the cost of the work, which totaled $160,000. The other items of work, including the construction of the detour and access road, as well as providing for surface drainage, handling the excavation, and restoring the roadway, were performed by local maintenance crews supplemented by equipment rented on a fully operated basis from contractors and equipment vendors.

In addition to the degree of success attained in stabilizing this slide by the partial unloading of material in conjunction with the drainage installation, it is also gratifying to note the success that resulted from following the plan that was adopted for the scheduling and conduct of the work. In spite of the large amount of work and the volume of material that had to be handled over this congested portion of highway, not a single traffic accident occurred on the job during working hours and the corrective measures and restoration were carried out with a minimum amount of inconvenience to traffic.

The operations for moving the slide and restoring the road to traffic were under the direction of Assistant District Engineer R. D. Kinsey, and under the immediate supervision of Highway Superintendent J. C. Campbell and Highway Foreman Jack Peirano. Construction engineering on this project was handled by the senior author. Corrective treatment for slides and the horizontal drilling work were under the direction of A. W. Root, Supervising Materials and Research Engineer, and under the immediate supervision of the junior author.



Plan of slide and horizontal drainage system

Traffic Engineering

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questions: "Where did your trip start?" and "Where will it end?"

These surveys, by showing where the traffic wants to go from the points where it originates, enable engineers to estimate how much of the traffic will use proposed alternate routes and which alternate route will serve the greatest number of highway users.

Accident Reports

Still another source of information is the accident reporting of the California Highway Patrol. Copies of all reports covering accidents on the rural state highway system are supplied to the Division of Highways for confidential use. These accident reports, combined with the traffic count data, are used in computing the accident rate for every section of the rural State Highway System.

The importance of accident rate figures is obvious. They have a bearing

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Placerville Freeway

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Structures Returned to Owners

After the moving contracts were awarded, W. H. Rust of the Wilkins Draying Company took charge of the project as a whole. He retained a dirt moving firm to move the material required and also obtained the services of a local building contractor who had built the clubhouse and the church to serve as subcontractors. The basement of the clubhouse was first built and then the material to be deposited on the lot was moved in and compacted.

Following this work the foundations were built for the clubhouse and church upon the filled ground. Each of the three sections of the clubhouse was then moved to the new foundation that had been built.

After the placement of the three structures on their new foundations, the residences disrupted along Jackson Street, the path of the moving operations, were returned to their original situations at a cost of about $5,000.

Today, the three structures formerly within the right of way are again in service and the market value of each has been enhanced materially by the relocation. At the original site the buildings had no parking space and were close to the railroad running through the city. In addition to the elimination of the railroad disadvantage the new site provides parking space for approximately 50 cars. Furthermore, both the church and the residence have basements which they did not formerly possess. The necessary repainting of exteriors and the installation of more convenient walkways have further enhanced the value of all the properties.

Cost Estimates

It should be noted that accurate cost estimates on all phases of the relocation work, including substitute property acquisition, had to be made before any agreements were made in order that a comparison could be made between costs of the moving arrangement and outright purchase of the properties.

The completion of this project to the satisfaction of all parties concerned and at a cost somewhat less than the cost to the state would have been, based on a buy-out at market value, required the cooperation of not only the three owners involved, but also the property owners whose improvements were affected in the course of moving. While the over-all saving to the state. resulting from this rather complicated moving transaction, amounts to a relatively small amount, the beneficial effects on public attitudes and the subsequent aid to further right of way clearance is immeasureable.

IN MEMORIAM
Edwin (Sarge) Carlstad

The sudden death from a heart attack of Assistant Highway Engineer Edwin Carlstad was a severe shock to his many friends. A valuable and experienced employee was lost to the Division of Highways.

Mr. Carlstad was born in Wisconsin on March 24, 1890, and settled in California in 1910. He was employed in the Engineering Department of the Panama-Pacific International Exposition in San Francisco from 1912 to 1915, then by Miller and Lux in the Bakersfield area as a surveyor until he enlisted with the military forces in World War I in 1917. After military discharge Mr. Carlstad, or Sarge, as he was affectionately known by his many friends, reported for work with District IV of the Highway Division on November 13, 1919, and worked continuously on field surveys and contract construction for the more than 32 years of his state service.

During this period he handled many large construction projects as resident engineer, and was resident engineer on a large freeway contract at the time of his death.

Mr. Carlstad is survived by his widow, Emilie; two daughters, Mrs. Barbara Geitz of Hayward, and Mrs. Mildred Merrill of Concord; and a son, Mr. James Carlstad of Klamath Falls, Oregon.

THE GREEN LIGHT

The green traffic light doesn't always mean it's safe to speed across the intersection without looking both ways, says the California State Automobile Association. Protective driving calls for caution, even when the green light says "go." Watch the other fellow—handle your car skillfully.

Santa Ana Freeway

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All bridge construction work is under the supervision of J. M. Curran, Resident Engineer for the Southern Section of the State Highway Bridge Department.

By G. C. SMITH, Resident Engineer

A CONTRACT was awarded June 22, 1951, to Winston Brothers Company, contractors, covering the construction of 2.5 miles of the Santa Ana Freeway within the city limits of Santa Ana, from Broadway on the north to First Street (U. S. Hwy. 101) on the south. This section of the freeway by-passes on the east the main business section of Santa Ana and passes through residential and agricultural land.

This contract, in addition to providing for grading and paving a four-lane divided freeway, also constructs the necessary grade separation overpasses and underpasses that are required with on and off ramps and outer highways.

The grade separation bridges are:

Main Street Overcrossing;
17th Street Undercrossing;
Lincoln Avenue Overcrossing;
Lincoln Avenue Underpass for the Atchison, Topeka & Santa Fe Railroad;
Grand Avenue Undercrossing;
Fourth Street Overcrossing;
Pedestrian Undercrossing at 20th Street.

The contractor has completed the clearing throughout and has made considerable progress on the grading. Work on all of the structures is now in progress except at the Main Street Overcrossing. Delay in getting this construction started is due to problems which have arisen in connection with detour construction.

The grading, paving, and incidental construction in connection with the road work is under the supervision of Resident Engineer F. E. Sturgeon.

The contract as a whole is 30 percent complete and the anticipated date for completion is February, 1953.

SIGNS FOR LIFE

Watch and obey traffic signs. They are not roadside decorations. They are there for your protection. Obeying such signs increases your life expectancy.

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borders, any funds other than their allocated shares of state gas tax funds. The District Court of Appeal, in a unanimous opinion handed down on November 16, 1951 (reported in 107 A.C.A. 706), rejected appellant's arguments on both of these points, and affirmed the judgment of the trial court.

Appellate Court Decision

On the first point, the appellate court took the view that the improvement of a state highway within a city was a matter of city, as well as state, concern, from which inhabitants of the city received a special benefit, and was a proper municipal purpose for which city tax funds could be expended without violating any provision of the California Constitution. On the second point, the court held that there was no indication in any of the sections of the Streets and Highways Code cited by appellant of any legislative intention to limit cities, in improving state highways within their boundaries, to gas tax moneys received from the State. On the contrary, the court pointed out, Section 113 alone showed that the Legislature intended expressly to permit the use by cities, in aiding in the improvement and maintenance of state highways within their boundaries, of any funds which the city might properly use for the construction and maintenance of its own streets.

Traffic Engineering

Continued from page 60 . . .

not only on the need and the priority—relative need—of a proposed highway improvement, but on the type of highway design which can best be expected to reduce accidents under certain conditions.

The computation of accident rates in connection with freeways is an excellent example of the superiority of facts over theories. We all remember the dire predictions, when the first freeways were designed and built, that the higher speeds they would make possible would mean more accidents and particularly more fatalities.

Freeways Safer

The facts have proved just the opposite. Accidents on full freeways—those with no intersections at grade—are just about *one-half* the average for the rural State Highway System as a whole.

As for fatalities, the record is even more impressive. The term "fatality rate" when applied to accidents on highways means the number of persons killed per 100 million vehicle miles of travel. On the rural State Highway System the fatality rate averages just about 10. On all of the full freeways constructed and in operation to date, the fatality rate is 2. This reduction in highway deaths on freeways is even more remarkable when we consider that freeways do indeed accommodate higher speeds. The secret lies in the fact that they are designed to accommodate higher speeds with safety and have many built-in safety features.

EARL WARREN
Governor of California

•

FRANK B. DURKEE
Director of Public Works

•

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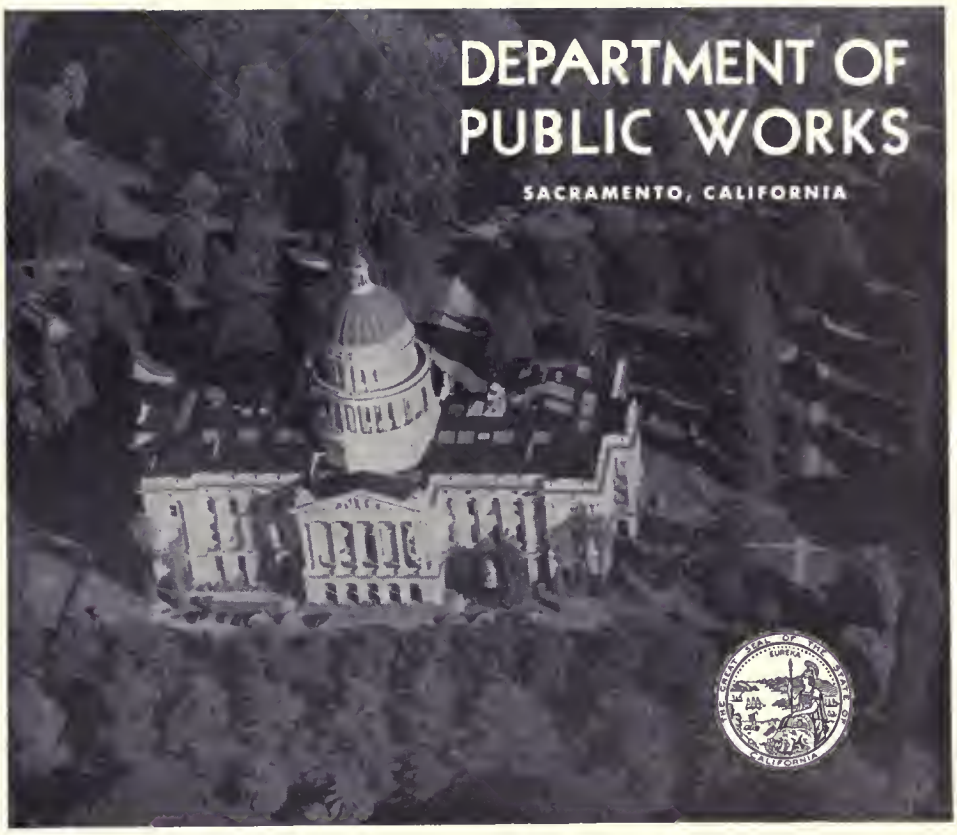
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Big Job

Role of Division of Highways in Development of the Freeway System for the Los Angeles Metropolitan Area

By P. O. HARDING, Assistant State Highway Engineer

In 1912 when California first started to construct a State Highway System the problem was one of getting out of the mud in the rural areas. Generally speaking, the cities had some surfaced streets permitting the very light vehicular traffic of that day to traverse the incorporated areas much more easily than the undeveloped roads of rural territory. The State Highway System was thus initiated as a rural system with official routes stopping at the boundaries of incorporated cities.

Difficulties of small incorporated towns to provide suitable surfaced arterial routes were recognized by legislation in 1925, permitting the extension and improvement of a highway route through a municipality with a population of not more than 2,500. The increasing vehicular traffic and the generally unsatisfactory condition of city streets as connecting links in a through arterial system brought increasing consciousness of this city problem. In 1932 there were 457 miles of city streets in the 202 California cities which were connecting links to state routes. The over-all rural State Highway System at that time was approximately 7,000 miles. The gasoline tax was 3 cents with 1 cent going to the counties for other rural roads and 2 cents reserved for the maintenance and improvement of the State Highway System.

Policy of Cooperation

In recognition of the city problem, by legislative authority, Statutes of 1931, a policy of cooperation in construction was inaugurated for those portions of the highway routings within the cities, and in 1932 several miles within cities were improved by state and local cooperation. In further recognition of this problem Chapter 767, Statutes of 1933, provided that the Department of Public Works would annually expend from the State Highway Fund an amount equal to the net proceeds of one-fourth of one cent per gallon tax of motor vehicle fuel upon



P. O. HARDING

state highway routes within incorporated municipalities. Still further recognition of this problem was given by the Legislature in 1935 which provided an additional one-fourth cent of the gasoline tax for maintenance, rights of way, construction or improvement on streets of major importance within the cities, off the State Highway System.

System Expanded

Both the 1933 one-fourth cent and 1935 one-fourth cent were taken from the state highway two cents of gas tax, thus reducing the expenditures upon the state rural system to 1½ cents. Coincident with the legislation reallocating these gas tax funds, the Legislature in 1933 and 1935 added some 6,800 miles of rural county roads to the state system, which, with the extended routes through the cities, resulted in a total State Highway System of approximately 14,000 miles. Both the county road additions and the city sections were generally deficient in standards of grades, alignment and major bridge structures to handle state highway traffic and these routes were generally designated as traversable routes taken over by the State for maintenance until such time as they could be improved to carry the legal loads and the prevailing volumes of traffic at the speeds expected for a State Highway System.

Lack of Funds

The responsibilities thus delegated to the State were far greater than the funds available to meet them, and at each successive biennial session of the Legislature the department tried to properly portray this problem in the interest of obtaining additional funds. These efforts were without success, although it was pointed out that we were losing ground in the fight to adequately take care of the rapidly increasing traffic throughout the entire State.

In December, 1941, this Country was precipitated into a world war and all construction work upon the State Highway System, as such, was stopped until its conclusion in late 1945. By this time the tremendous growth of the State, due to its strategic military location with relation to the vast war operations in the Pacific, had produced a traffic situation, the full impact of which was not realized until the removal of gasoline rationing and other wartime controls.

Collier Committee Goes to Work

Governor Warren recognized this problem and the particularly acute situation within the cities and urged the passage of legislation to provide the additional funds necessary for modernizing our State Highway System. The 1945 Legislature felt that this situation required comprehensive study before the enactment of definite legislation and accordingly appointed a joint Senate-Assembly committee headed by Senator Randolph Collier of Yreka, which was to report back to the 1947 Legislature with recommendations. This committee in the interim period solicited

information from the State Division of Highways, from each of the 300-odd incorporated cities, and each of the 58 counties in the State. It visited all sections of the State to receive all the factual data available on the street, highway and road problems from these three levels of government.

Los Angeles Problem Acute

The transportation problem in Los Angeles has become particularly acute due to the generally decentralized development over this large metropolitan area. The incorporated area within the city limits of Los Angeles is 453.47 square miles but the 45 other incorporated cities within Los Angeles County and the tributary cities in Orange, Riverside and San Bernardino Counties to the south and east and Ventura County to the north and west make the actual boundaries of the metropolitan area most difficult to define. The population of Los Angeles County alone, according to the 1950 Federal Census, was 4,151,687, with the population of Los Angeles City 1,970,358.

The latest figure on vehicular registration in Los Angeles County as of the end of 1951 is 2,133,641. Los Angeles, as a city with nearly half the population and the worst congestion of the county, has been a natural leader in studies of vehicular transportation facilities in this metropolitan area. It has been assisted, and its studies expanded since the 20's by the county and by various governmental, civic, and private organizations, showing the widespread recognition of the seriousness of the transportation problem.

Years of Planning

It can thus be seen that the Los Angeles Metropolitan Freeway System planned for this area did not develop overnight. It has matured through the years through the cooperation of governmental units, civic organizations and public-spirited citizens, and tribute must be given to all. Individuals and organizations now accept it as a transportation system evolved for the benefit of the people as a whole, through the functioning of democratic processes.

It would be impossible to list all the people and organizations who have had a part in these coordinated studies. Some of these organizations have published comprehensive reports, others have issued and distributed reports which were not published. Still others have taken an active part in meetings and discussions in informal manner in furtherance of the cooperative spirit and attitude of this comprehensive undertaking.



Freeway Network Laid Out

It is believed that the general consensus of these organizations is expressed in the report of the Los Angeles Metropolitan Parkway Engineering Committee to the Collier Joint Fact-Finding Committee on Highways, Streets and Bridges of the California Legislature, dated March 30, 1946. This report was signed by the Mayor of Los Angeles, the Chairman of the Los Angeles County Board of Supervisors and a representative of the Los Angeles County Section of the League of California Cities. It points out that the com-

mittee was originally composed in 1944 of city and planning engineers of the City of Los Angeles, the county and the cities immediately adjoining Los Angeles, but was later expanded in 1946 to include engineering representatives of all cities within Los Angeles County.

This committee laid out a network of freeways totaling some 613 miles in the most congested portions of the metropolitan area, which was unanimously approved by the expanded committee. There is reproduced herewith the central portion of the Los Angeles County Regional Planning Commission map included in this report.

Including the arterial routes added by the Legislature in 1947, about one-fourth of the total mileage of the committee's freeway network is a part of the State Highway System. The Collier-Burns Act provided additional funds for the cities to improve their major street systems, for the counties to maintain and improve county roads both inside and outside incorporated areas, and for the State to improve its system both inside and outside the cities.

Counties and Cities Help

These additional funds, however, quickly proved insufficient to solve the modern traffic problem, which had been further aggravated by the postwar increase both in population and vehicles, and by the steady rise in highway construction costs.

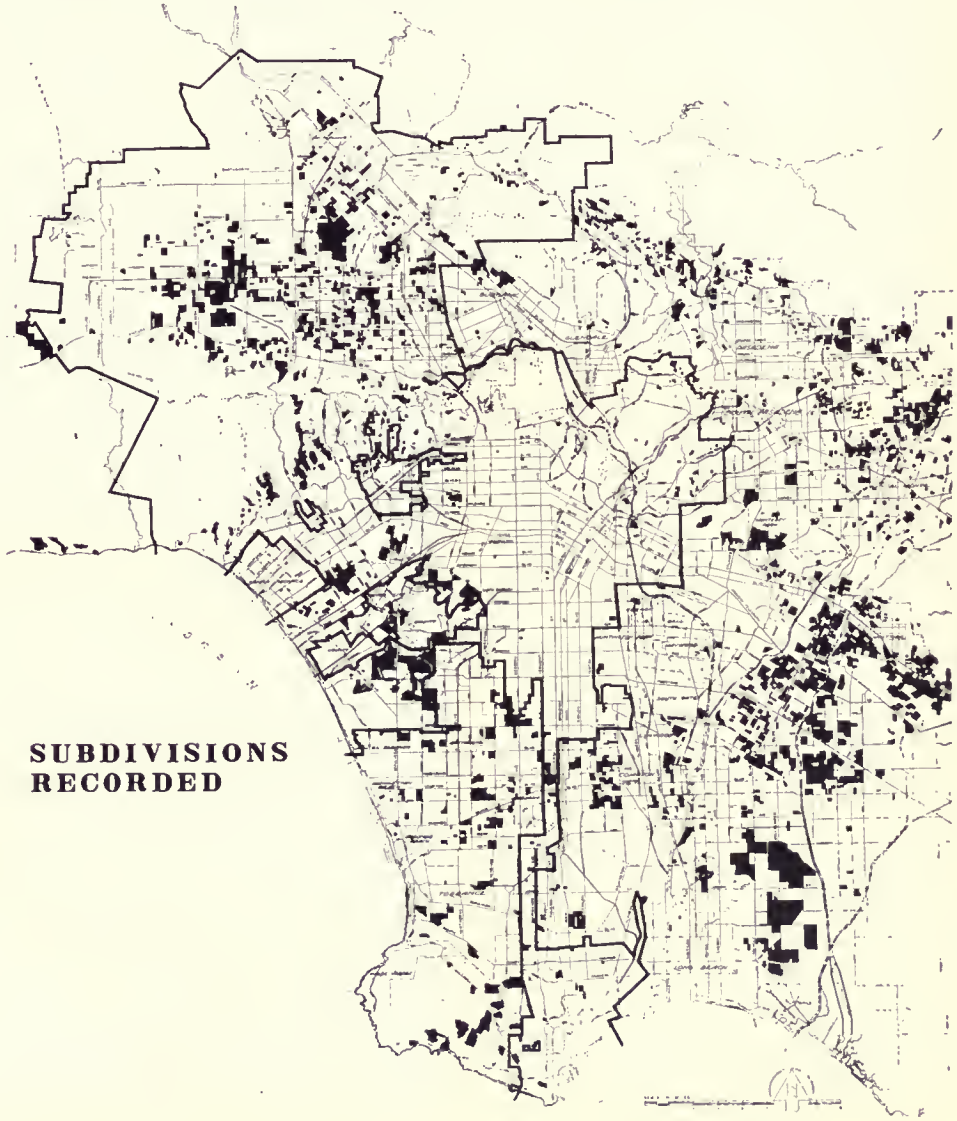
Faced with these conditions it has been impossible for the cities to do very much toward solving their share of the freeway problem. Both the cities and the counties through their planning commissions and engineering departments have been most helpful in planning subdivision developments in conformity with projected freeway lines for which there are no present funds to purchase rights of way. The State, in order to establish a freeway, must acquire the property access rights along the freeway route, but the State, as such, does not have the detailed power necessary to control local zoning setbacks and land use development, this being vested in the city and county legislative units of government. The planning commissions of these local agencies are doing notable work in protection of future freeway routes both for their own sections of freeway and for those on the state highway routes.

Looking to Future

The inadequacy of funds for the State to progress as rapidly as desired

Years	In the city of Los Angeles		Outside city of Los Angeles	
	Number of Subdivisions	Number of lots	Number of subdivisions	Number of lots
1945 to 1950 inc.	1,136	55,593	1,622	108,784
1951	255	7,866	248	17,144
1945 to 1951 inc.	1,391	63,459	1,870	125,928

Grond Total
3,261 Subdivisions
189,387 Lots



CITY PLANNING COMMISSION
LOS ANGELES

SUBDIVISIONS RECORDED

has been accentuated by the extreme residential and industrial subdivision which has occurred in the Los Angeles Metropolitan Area since the war. It has been impossible for the local planning bodies to completely control subdivisions to protect rights of way for those freeways for which financing does not appear to be available in the foreseeable future. In such cases, however, they have in many instances been able to arrange the subdivision so as to minimize the number of improvement units involved and best fit the future freeway into the actual pattern of the subdivision.

The accompanying map, showing new subdivisions in the postwar period 1945 to 1951 inclusive, is indicative of the tremendous growth of the area. Subdivision activity reached a peak in the first quarter of 1950, at which time there were some 18,000 lots recorded. The largest subdivision in one unit has been that within the unincorporated territory in the Lakewood area north of Long Beach where some 17,500 homes are planned, more than half of which have been completed at the present time. This subdivision includes street layouts with separate frontage roads, and complete shopping, recreational, school and other civic facilities. It is truly a well planned and well executed community development.

New Subdivisions

As can be seen from the map, however, subdivisions have been springing up everywhere that vacant land is available for such purposes. In prewar subdivisions building of residences usually progressed in a kind of hit or miss manner extending over a period of several years. A notable difference in this postwar subdivision effort, due to the extreme house shortage which developed during the war, has been the immediate building of residences upon every available lot within the new subdivision and the almost immediate sale and occupancy of those residences within a very short period of time after their construction.

Active Real Estate Market

It is felt that such freeways as we have been able to program funds for right of way acquisition and construction have themselves been a factor in the surge of subdivision activity within the traversed territory and beyond. This very active real estate market, combined with the general inflationary trend in all prices, has materially affected the costs of both right of way acquisition and construction out of all proportion to the more or less fixed revenues of the increased motor vehicle registration. Furthermore, each new resident and each new motor vehicle has accentuated the traffic problem so that we are confronting new critical deficiencies at a more rapid rate than we are able to overcome the old deficiencies.

This condition, of course, confronts both the city and county governments with respect to all public services including water supply, sanitary sewers and sewage disposal, flood control and storm drains, garbage and rubbish collection, schools, parks, playgrounds, public buildings, police, fire and health protection. The demands on the tax dollar of every level of government within the State have been stretched to the limit to provide for the over-all expanding economy of the State.



View looking easterly along Hollywood Freeway from above Figueroa Street, showing Hollywood-bound traffic on left and Los Angeles Civic Center-bound traffic on right. In the center background are the Los Angeles Civic Center buildings, the one in the center being the Hall of Justice, the large building to the left and rear being the Federal Building, and the City Hall, with its tower, to the right.





Cost of Freeways

The cost of metropolitan freeways will vary from block to block. The trend of cost, however, per mile depends upon the percentage of property that has been improved together with the land values, values of improvements, and the design of the freeway itself. If the freeway can be laid out to parallel existing streets, it usually requires some 212 average 50-foot lots per mile without any expansion for interchanges. The actual number required depends upon the spacing of the

UPPER—Looking northerly from Elysian Park along Arroyo Seco Parkway, the four-lane, high-level road to the left carrying traffic into the Los Angeles Civic Center and the lower roadway to the right through the tunnels carrying outbound traffic. The junction with Riverside Drive is at center left of photograph. It is this section of the Arroyo Seco Parkway, between the Riverside Drive junctian and the Castelar Street junction, where recent counts show traffic in excess of 100,000 vehicles for a 24-hour period. LOWER—View along Arroyo Seco Parkway in the South Pasadena area.



Looking westerly along Santa Ana Freeway from east city limits of Los Angeles near Indiana Street

interchanges and to a large extent upon the design of those interchanges. If the freeway cannot be located parallel to existing streets, the number of properties affected per mile will normally be increased upward 25 or 30 percent, for the design must include, in addition to the freeway proper, rearrangement of the street pattern outside the freeway right of way for the proper circulation of local travel.

If the freeway traverses long cross blocks and calls for the inclusion of parallel frontage roads on each side of the freeway, there may be a further increase in the number of lots affected per mile. As soon as a lot has been improved, the combined value of the improvement and lot may reach 10 times the value of the vacant lot. There is some salvage to the improvements when the right of way is ultimately cleared for construction so that the improved value will generally bear relationship of from six to eight times the value of the unimproved property. Thus the cost of the right of way for a metropolitan freeway may vary within rather wide limits, depending upon the percentage of improvement of the property in the area traversed.

Future Trend Anticipated

The construction cost of the freeway will similarly vary with the percentage of improvement of the property. If the freeway can be constructed before there is any appreciable development, it can be established as the guide for the future trend of development in the area. It can oftentimes be constructed at ground level with provision for future grade separations, if and when needed at cross streets, to be elevated over or depressed below the freeway and the right of way for these facilities should be acquired in the initial right of way program.

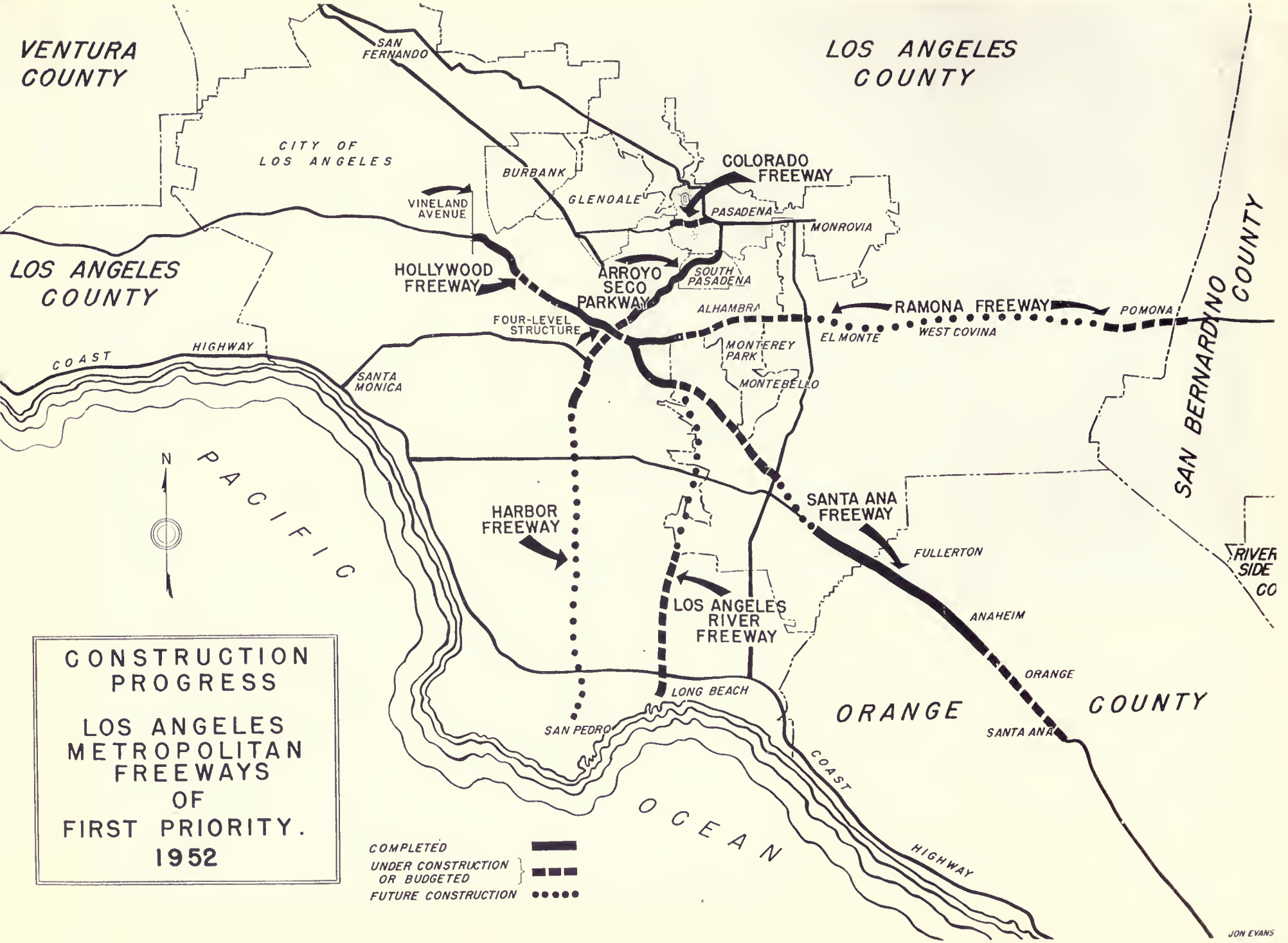
On the other hand, if the freeway is traversing a fully improved section of the city, the design of the freeway itself has to meet the established street pattern which will call for additional grade separations and interchanges. It will generally mean that the freeway has to be completely elevated or depressed to avoid the far-reaching property damages upon cross arterials in attempting to elevate or depress well developed streets at frequent intervals across the freeway.

The cost pattern in itself presents a problem in determining whether the freeway program should progess inward from the outlying, relatively undeveloped areas where the traffic has not yet reached acute stages, or whether they should progress outward from the costly developed areas where traffic congestion has assumed alarming proportions.

Under the first procedure the overall freeway program could be realized much more quickly and at appreciably less cost than under the latter. Under the second procedure the development proceeding ahead of the right of way acquisition and construction will increase the cost and time of realization of completing the program but will provide traffic relief most quickly and where most needed. This presents a situation something like the argument as to which comes first, the chicken or the egg. Should the freeway come first, or the development? In many cases we have no choice—the development is already here.

Justification

The major justification for the metropolitan freeway is to relieve the creeping paralysis of traffic congestion which has been taking place upon the existing street arterials. The benefit of the freeway is therefore direct in the


VENTURA COUNTY
LOS ANGELES COUNTY
SAN FERNANDO
CITY OF LOS ANGELES
BURBANK
GLENDALE
PASADENA
MONROVIA
SOUTH PASADENA
ALHAMBRA
EL MONTE
WEST COVINA
POMONA
MONTEREY PARK
MONTEBELLO
SANTA MONICA
COLORADO FREEWAY
VINELAND AVENUE
HOLLYWOOD FREEWAY
ARROYO SECO PARKWAY
FOUR-LEVEL STRUCTURE
RAMONA FREEWAY
COAST HIGHWAY
HARBOR FREEWAY
SANTA ANA FREEWAY
LOS ANGELES RIVER FREEWAY
FULLERTON
ANAHEIM
ORANGE
LONG BEACH
SAN PEDRO
SANTA ANA
ORANGE COUNTY
SAN BERNARDINO COUNTY
RIVERSIDE CO
PACIFIC OCEAN
N
CONSTRUCTION PROGRESS
LOS ANGELES METROPOLITAN FREEWAYS OF FIRST PRIORITY.
1952
COMPLETED
UNDER CONSTRUCTION OR BUDGETED
FUTURE CONSTRUCTION
JON EVANS

time savings afforded to those users of the freeway who have been diverted to same from the existing city streets. A second and indirect benefit, however, occurs in speeding up all the remaining local travel through the relief of congestion provided to those city streets. These are far reaching benefits.

Traffic upon rural freeways is that previously established upon an existing route and subject only to the normal trend of increase occasioned by the over-all economic growth of the area which it traverses. In contrast to this, the traffic of a metropolitan freeway represents the cumulative diversion from more or less parallel arterials within rather wide limits on either side of the freeway insuring a full traffic load upon the freeway as soon as it is fully opened to properly serve the over-all traffic of the area. For example, a 2½ mile section of the Hollywood Freeway was opened to traffic December 27, 1950. It immediately carried 32,000 vehicles per day. Within three months this had increased to 38,000 and in another four months to 44,000.

Increasing Traffic

The opening in September, 1951, of an additional 2½ miles increased the volume of the first section to some 70,000 vehicles per day. On December 20, 1951, we opened the civic center section of the Hollywood-Santa Ana Freeway and traffic upon this former section jumped to in excess of 91,000 vehicles per day. More recent reports show that this has now increased to over 99,000 vehicles per day. This traffic has all originated from the previously overcrowded parallel arterials of the vicinity.

In spite of the many problems confronting us and the inadequate financing of progress as rapidly as we feel we should, notable progress has been made upon the major arterial freeways of the Los Angeles metropolitan area. Since the war, the State Division of Highways has spent or obligated $150,000,000 and has budgeted for the 1952-53 Fiscal Year an additional $28,000,000 on these freeways.

The Division of Highways has been assisted in this program by the construction industry and its many fine contractors who, under our system of free enterprise and under the keenest competition, have provided us with the most economical results possible under the restrictions of controlled materials and other numerous obstacles.



View from Whitley Heights looking easterly along construction in progress on Hollywood Freeway. In the foreground is concrete foundation of building that has been moved to clear right of way; in the middle foreground is the Cahuenga Boulevard Undercrossing nearing completion; and in the background is the spire of the Hollywood Presbyterian Church

Hollywood Freeway Financed

The Hollywood Freeway is now completely financed, the last major construction unit to connect with the existing freeway in Cahuenga Pass being placed under contract February 14, 1952. All of the required rights of way have been secured and all but minor right of way clearing completed. In the 6¾ miles between Spring Street in the civic center and Cahuenga Pass a total of 1,709 buildings have been removed and 87 have been demolished. These have been of various types, including many multiple unit residential dwellings and this program has been accomplished without a single legal eviction of any of these tenants involved.

In this connection it is interesting to note that many of the homes relocated as a result of freeway development now present a better appearance in their new and more pleasant surroundings.

The Cahuenga Pass section of 1.3 miles was originally constructed by the city with state and federal financial cooperation. The 1.8 mile section beyond the Cahuenga Pass to Vineland in the San Fernando Valley was opened to traffic in January, 1949. By the end of 1952 there will be 5½ miles from the civic center to Hollywood Boulevard under traffic. There should be completed prior to the end of 1953 the entire 10.1 miles from the civic center to Vineland at an estimated total cost of about $55,000,000.

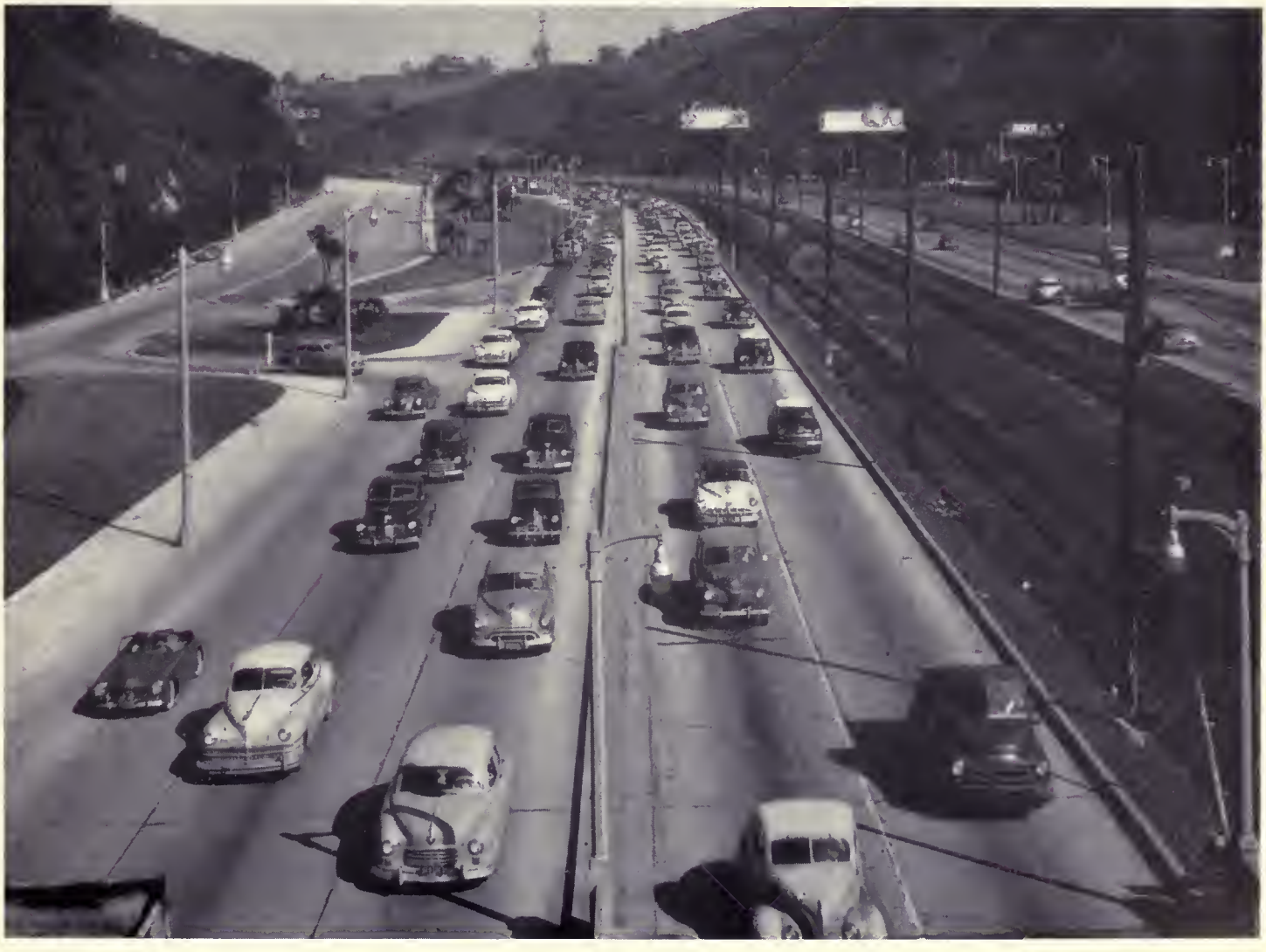
Arroyo Seco First

The Arroyo Seco Parkway was the first freeway of appreciable length constructed in this area. It was opened to traffic for a six-mile length between Avenue 22 in Los Angeles and Glenarm Street in Pasadena December 30, 1940. It was later extended to connect with Castelar Street and Figueroa Street to serve the downtown area. We have yet to pull the plug, as we call it, in making a connection between Figueroa Street and the four-level interchange structure that will throw this freeway into the system. It is expected that this will be advertised for contract within a month's time now that additional outlets from the system have been provided for the downtown area. The Arroyo Seco Parkway, lying largely through park lands of Los Angeles and South Pasadena, was not subject to the excessive right of way costs of today. It was largely constructed at a time when construction costs were approximately 40 percent of those of 1952 although it involved in its eight-mile length a total of 43 contracts. The total cost is estimated to be approximately $10,000,000.

Harbor Freeway

The Harbor Freeway from the four-level interchange to Battery Street in San Pedro involves a total length of 22.8 miles. By mid-1952 that section from the four-level interchange one-half mile in length to Third Street will have been completed and opened to traffic. Work was started in 1951 and will be continued during 1952 on construction contracts to extend this freeway from Third Street as far south as Olympic Boulevard. This 1.6-mile section will act as the distributor to and from the central business district of Los Angeles. It involves a comprehensive system of collector roads to provide a reservoir of storage to permit the gradual absorption of off-bound traffic into the congested downtown area. Right-of-way acquisition beyond Olympic Boulevard is now under way as far southerly as Santa Barbara Avenue adjacent to the Coliseum and University of Southern California. Right-of-way acquisition in the San Pedro district at the southerly end of this freeway is expected to start in the near future. In the clearing of rights of way to date there have been 315 buildings

Looking northwesterly along portion of Hollywood Freeway through Cahuenga Pass from Pilgrimage Bridge. The oncoming traffic is inbound, with the two lanes to right headed for Cahuenga Boulevard and the two lanes to left headed for Highland Avenue. Traffic is over 105,000 vehicles per 24 hours.





Looking easterly from the Grand Avenue Bridge along portian of Hollywood Freeway through the Los Angeles Civic Center. The bridge in the middle foreground is recently completed Hill Street Overcrossing; the buildings to the left are the Los Angeles Board of Education administration buildings; and the buildings to the right are the Federal Building and the Hall of Justice.

of all types and descriptions removed and 89 demolished. The Division of Highways has awarded 10 major construction contracts to date. Total expenditures for rights of way and construction to date is approximately $24,000,000.

Figueroa Street

Present Figueroa Street, State Highway Route 165, which will ultimately be superseded by the Harbor Freeway, involves 62 sets of traffic signals between Temple Street adjacent to the four-level interchange and Battery Street in San Pedro. Within this distance there is a total of some 200 cross streets which has slowed traffic for the over-all distance to speeds varying between 25 and 35 miles per hour, and requiring a total travel time of approximately 55 minutes in off-peak periods and more than one hour during peak periods. It has been estimated that upon completion of this freeway the entire trip can be made in 27 minutes.

Santa Ana Freeway

On the Santa Ana Freeway by the end of 1952 construction should be completed for the entire 10 miles between Aliso Street east of the Los Angeles River and Lakewood Boulevard. During 1952 construction will also be under way on the important downtown one-third-mile section on Aliso Street between Los Angeles Street and Lyon Street. Construction on the 2½-mile section through the City of Santa Ana at the extreme southeasterly end of this freeway is approximately 40 percent completed to date. Much of the right of way on the Santa Ana Freeway within and just outside the City of Los Angeles was purchased prior to the full impact of the present real estate inflationary trend. In clearing the right of way a total of 744 buildings have been removed and 39 have been demolished to date. The State Division of Highways has awarded 57 construction contracts in the over-all 32-mile length between the Civic Center in Los Angeles through Santa Ana, of which some 22 miles have been completed. The total expenditures for rights of way and construction to date is $37,000,000.

Ramona Freeway

The Ramona Freeway was originally constructed in 1935 as a conventional highway for the two-mile section from Aliso Street east of the Los Angeles River to the city limits at Indiana Street. It was converted to a freeway immediately after the war, this being accomplished in 1946. The 1.8 miles just beyond the Los Angeles city limits to Helen Drive was completed and opened to traffic in April, 1951.

A grade separation at Rosemead Boulevard adjacent to El Monte was completed and opened to traffic on Rosemead in September, 1951. Between Helen Drive and Rosemead there are seven major contracts under way, all of which should be completed

by the fall of 1953, thus opening to traffic the full 10-mile length from Aliso Street to Rosemead Boulevard. Right-of-way acquisition has been under way on the easterly end of this freeway for the past two years in the Pomona-Claremont area and construction is expected to start within two months of the present date. Much of the heavily improved right of way of this freeway was also acquired prior to the period of heaviest inflation. To date 256 buildings have been removed and 19 demolished in clearing the rights of way. A total of 26 construction contracts has been awarded by the Division of Highways in the overall total 30-mile length of this freeway within Los Angeles County between Aliso Street and the San Bernardino county line. Total expenditure to date for rights of way and construction is approximately $17,000,000.

Los Angeles River Freeway

The Los Angeles River Freeway is under construction and approximately one-third completed for the 2½ miles in Long Beach between the Pacific Coast Highway, State Route 60, and 223d Street. It is expected that contracts will be advertised for bids in April for the construction of several bridge structures between 223d Street and Atlantic Avenue in Compton. In clearing the right of way to date 189 buildings have been removed and one demolished. Total expenditure to date is approximately $4,000,000 for rights of way and construction.

The Los Angeles River Freeway was put into the State Highway System by the Legislature in 1947. For a number of years prior thereto, however, under the general guidance of the Los Angeles County Regional Planning Commission, this general route was laid out and protected. The City of Long Beach was instrumental within its city limits in reserving all of the vacant lands for this future freeway. Both the city and county assumed responsibility for reserving freeway space in several major structures constructed by them across the route of the freeway.

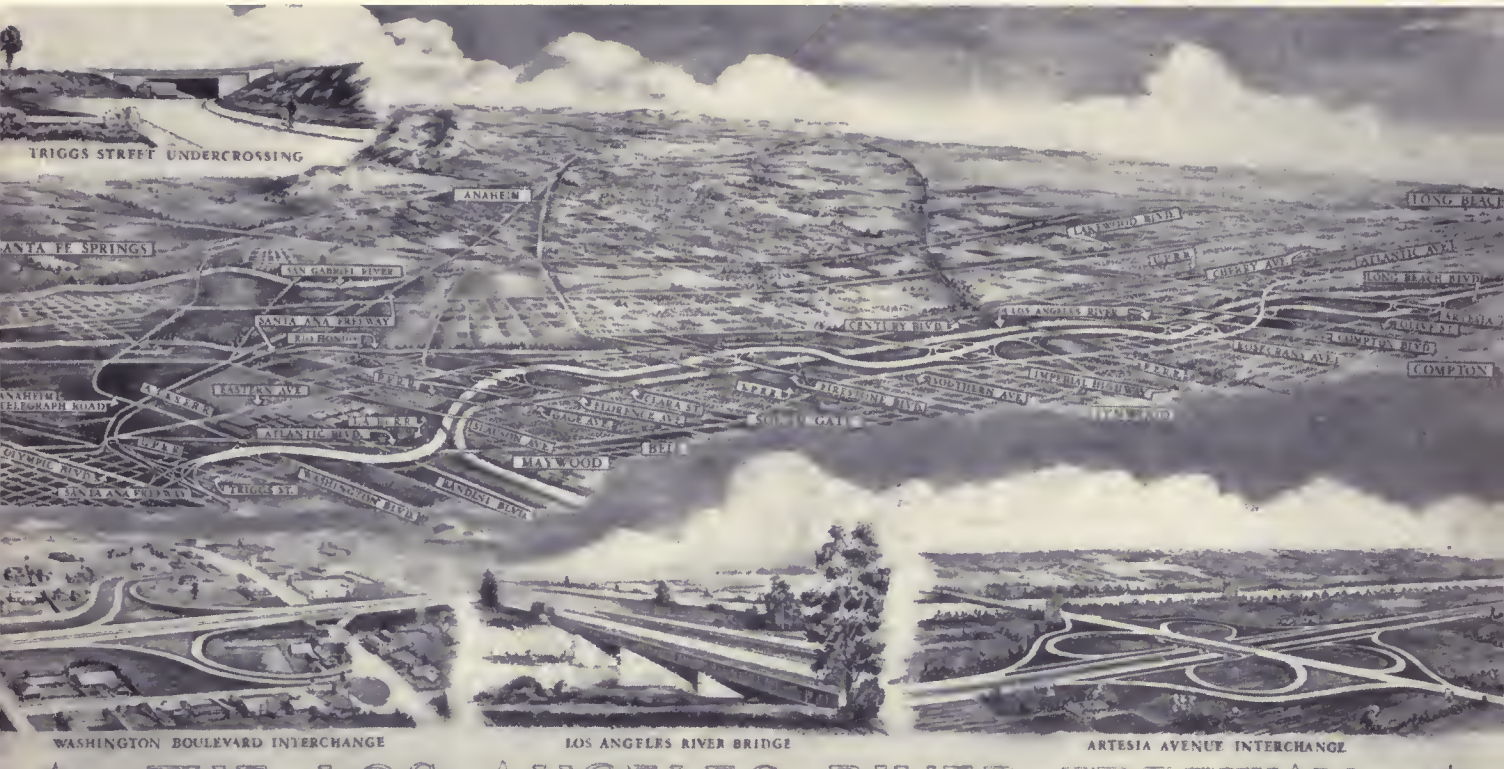
The present southerly terminus of the state highway portion of this freeway is at the Pacific Coast Highway. The southerly extension of the Los Angeles River Freeway, from the Pacific Coast Highway to the Long Beach Harbor area, requires special mention because the construction work now in progress by the City of Long Beach is the only instance since World War II of another governmental agency carrying out the construction and financing of a complete unit on the Los Angeles Metropolitan Freeway System. This part of the Los Angeles River Freeway is not on the State Highway System and the State has no responsibility with respect to it except in the review of plans for approval as a major city street project eligible for gas tax funds. Over a period of several years the City of Long Beach has been designing and acquiring rights of way on this 1.6 miles of freeway.

Grade Separation

Nearing completion is the Guy F. Atkinson $2,000,000 contract for a full interchange grade separation structure at Anaheim Street, with completion scheduled for September, 1952. All rights of way have been secured by the City of Long Beach and it is

View looking westerly along Hollywood Freeway showing in foreground Belmont Avenue pedestrian overcrossing. Heavy traffic on both roadways of the freeway will be noted. Over 99,000 vehicles per 24 hours have been counted.





THE LOS ANGELES RIVER FREEWAY

FROM OLYMPIC BOULEVARD TO ARTESIA AVENUE

VII - LA - 167 - LBch. A, Com. Sgt. B.

Bridge Department



THE LOS ANGELES RIVER FREEWAY

FROM ARTESIA AVENUE TO PACIFIC COAST HIGHWAY

VII - LA - 167 - LBch. A, Com. Sgt. B.

Bridge Department

expected that a city contract will be advertised and awarded in April, 1952, for building the freeway southerly from the Pacific Coast Highway to Anaheim Street. From Anaheim Street southerly into the Harbor area, design is under way by the City of Long Beach for grade separation structures and bridges across the Los Angeles River at Ninth Street and other streets with full traffic interchange facilities. It is expected that this freeway, for which the City of Long Beach has accepted responsibility for design, construction and financing, will be completed and opened to traffic within about two years' time, with the total estimated cost being in the neighborhood of $10,000,000, all financed from other than state highway funds.

Colorado Freeway Bridge

The Colorado Freeway bridge over the Arroyo Seco, which was awarded to the Guy F. Atkinson Company at a cost of $3,389,650, is the largest single contract ever awarded by the State Division of Highways. Active construction of this bridge joining Pasadena and the Eagle Rock section of Los Angeles was officially started on May 3, 1951, and ground-breaking ceremonies were held on the site of the work. In clearing the right of way 10 buildings were removed and two demolished. In spite of difficulties in obtaining steel the contractor has made exceptional progress, and this project with a completion date estimated for July, 1953, is approximately 35 percent completed at the present time.

Sepulveda Freeway

The Sepulveda Freeway from Ventura Boulevard in San Fernando Valley to the Los Angeles River Freeway near 223d Street is 33 miles. Construction of this freeway has not been started but right-of-way acquisition has been in progress since the end of the war. No concerted effort has been made to clear up right of way for any specific section of this freeway. Right-of-way acquisition activities have been confined to "distress" cases and to special instances where it has been necessary to acquire vacant land ahead of contemplated private development that would have greatly increased the later right-of-way acquisition costs.



View looking easterly along Ramona Freeway from above the east city limits of Los Angeles, showing the City Terrace area. The bridge in the foreground is the overhead structure for inbound traffic from the City Terrace area. In the center left is shown the Herbert Street Overcrossing and in the left background is shown the Eastern Avenue Overcrossing.

To date $3,000,000 has been spent for right-of-way acquisition on the Sepulveda Freeway.

Allesandro Freeway

Construction of the Allesandro Freeway has not been started but right-of-way acquisition is under way. The total length of this freeway that has been covered by a freeway agreement with the City of Los Angeles is 1.4 miles. This is a very important section of freeway, extending from Fletcher Drive to Avenue 36 near Eagle Rock Boulevard, because it will provide a badly needed railroad grade separation with the Southern Pacific Railroad, and also a highway grade separation with San Fernando Road. The total expenditure to date for right-of-way acquisition is approximately $1,500,000.

Terminal Island Freeway

The Terminal Island Freeway, 3.1 miles in length, extending from Seaside Boulevard on Terminal Island to Willow Street, was constructed by the State Division of Highways at the request of the Navy as a federal access road for the Navy. This freeway, while on the Los Angeles Metropolitan Freeway System, is not on the State Highway System, and no state money was utilized either in its design, right-of-way acquisition, or construction. This freeway was financed by federal funds and Navy funds, the total expense being about $14,000,000.

Ridge Route

The Ridge Route, while not on the Metropolitan Freeway System, as such, is U. S. Highway 99, a very important



Looking eosterly across Arroyo Seco, showing old Colorado Street Bridge on right and new construction in progress on left for the Colorodo Freeway Bridge. Buildings in business district and civic center of Pasadena show in background.

north-south arterial connecting the Los Angeles metropolitan district with the fertile and productive San Joaquin Valley and is deserving of brief mention. The conversion of this three-lane highway into an expressway (a limited access freeway) was started after the war and by May of 1952 the 45.2 miles from the north city limits to the Kern county line and the five-mile section from the Los Angeles county line to Fort Tejon in Kern County will have been completed and placed under full traffic load. The cost of the portion within Los Angeles County for rights of way and construction is approximately $12,000,000.

Ventura Baulevard

The Ventura Boulevard expressway, in the same general category as the Ridge Route, is not on the Metropolitan Freeway System, but is an important state highway route, U. S. 101, acting as a feeder to the Hollywood Freeway and connecting north coastal cities with the Los Angeles metropolitan area. The total length of Ventura Boulevard from Vineland Avenue in the City of Los Angeles extending through Ventura County to the Santa Barbara county line is 61 miles. Of this total mileage 21.6 miles have been converted since the war to a four-lane limited access freeway at a total cost for right of way and construction of $7,500,000.

Looking to the future of the Los Angeles Metropolitan Freeway System, it is estimated there will be required some $500,000,000 to $600,000,000 additional financing to complete the main state highway arterial routes necessary as the basic or backbone network of the overall system. The time required to complete this with the present funds available is a matter of simple arithmetic.

Traffic and Population

The pressing need for freeways is evidenced by the traffic upon those short sections already completed and opened to traffic. Recent counts upon



UPPER—Looking easterly along Fletcher Drive at grade crossing with Southern Pacific Railroad showing vehicles held up by freight train. The proposed Allesandro Freeway, located to the right just off limits of photograph, will provide grade separation with the Southern Pacific Railroad as well as with San Fernando Road and eliminate traffic delays that are now common occurrences. LOWER—View northerly along viaduct on Terminal Island Freeway leading to Commodore Schuyler F. Heim lift span bridge that was designed by State Division of Highways. Low level bascule bridge shown at extreme left.



the Hollywood Freeway have been cited. On the Arroyo Seco Parkway between the Castelar junction and Riverside Drive junction our counts show traffic in excess of 100,000 vehicles for a 24-hour period. Both state and city checks of traffic on the Cahuenga Pass section of the Hollywood Freeway show this to be carrying in excess of 105,000 vehicles in 24 hours. Imagine the congestion that would result on the city street system if any of these sections of freeway were closed to traffic.

The population of the City of Los Angeles increased from 1,504,277 to 1,907,358 in the decade from 1940 to 1950. In this same period the assessed valuation of the city increased from $1,281,632,625 to $2,428,594,985, an increase of nearly 90 percent. The

assessed valuation of the city today is in excess of $2,480,000,000 and that of the county approximately $5,350,000,000.

For an area which lives on rubber-tired vehicles, there can be no question that freeways are an indispensable economic lifeline. The economy of the Los Angeles metropolitan area could not be maintained at its present level without them, and its future prosperity depends in large measure on the realization of the long-range freeway plans. The cost of building the Los Angeles freeway network may appear high; but the cost of not building it would be infinitely higher.

LETTER FROM ARGENTINA

BUENOS AIRES

MR. KENNETH C. ADAMS, *Editor*
California Highways and Public Works
Sacramento, California

DEAR SIR: I have received your courteous letter dated December 20, 1951, in which you inform me I have been placed on the mailing list to receive *California Highways and Public Works*.

Thank you very much. It will be for me a pleasure to receive your magazine which holds one of the first places among those publications which keep us up to date on the most important highways works, especially in your State.

Very truly yours,

CARLOS NOYA SCHOO
Ingeniero de Conservación
Administración General de
Vialidad Nacional, Argentina

STAY ON SLOW SIDE

Knowing that you should always drive at a safe speed is one thing. Knowing what that safe speed should be is often quite another. The wise motorist always plays it safe by underestimating the speed at which he should drive. The wise motorist stays on the slow side, and keeps himself safe.

RATON PASS

Raton Pass, which lies on the main route from Colorado down into New Mexico, is reported by the National Automobile Club to have been named for the many pack rats that live in the area.



Looking northerly along Harbor Freeway construction between Beaudry Avenue on the left and Figueroa Street on the right. The four-level grade separation structure and the Hollywood Freeway appear in the central part of the photograph with Pasadena in the background. The completed construction in the foreground is the Third Street Overcrossing.

AUTO CLUB URGES MOTORISTS, PEDESTRIANS TO CUT TRAFFIC FATALITIES

Southland motorists and pedestrians have been called on by the Auto Club of Southern California to assume full responsibility for traffic safety as auto fatalities continued to increase during the first three months of this year.

Auto accidents killed 466 persons in 12 Southern California counties during the first quarter. This is a 4 percent increase over last year and nearly 47 percent above the same three-month period of 1950.

The Indians of New Mexico have no written language. Their myths have been passed orally from generation to generation and they are among the most interesting to be found in the world.

FROM LONDON

"SHELL" REFINING AND MARKETING COMPANY LIMITED

25 Bagley's Lane, Fulham, London, S. W. 6

THE EDITOR
California Highways and Public Works

DEAR SIR: In advising you of my change of address, I should like to take the opportunity of saying how much I appreciate receiving a copy of *California Highways and Public Works*. You have been sending me your journal since I visited California in 1946 and I find it of great interest, both for its technical content and the references to men I met during my visit. I look forward to receiving it in the future.

Yours truly,

J. F. T. BLOTT

County Roads

Humboldt Commissioner Discusses Increasing Problems of His Job

By JOHN DAVIS, Humboldt County Road Commissioner

For many years a popular subject of complaint has been the condition of county roads, not alone in Humboldt, but in many other counties in this State and others. We in Humboldt, along with Del Norte and Mendocino Counties, have problems which are quite similar in nature. First, our principal industry, logging; our mountainous terrain and climatic conditions involving a long rainy season.

Before condemning county officials responsible for maintenance of the road system, perhaps we should stop and consider some of the factors causing a deterioration of these roads, also the public demand for improved road alignment.

Many existing county roads are a product of a "Topsy grew" situation. Years ago, old trails were widened to accommodate the horse and wagon. As construction equipment was strictly limited to hand shovels, wheelbarrows and horse-drawn scrapers, it was not feasible nor economically justifiable to move large quantities of earth. Therefore, the least amount of earthwork moved governed the alignment and grade of the road. This naturally resulted in very crooked alignment in mountainous areas.

Early Travel Limited

With the advent of the motor car, these roads were further widened and a gravel or rock base added. Prior to 1940, traffic was limited mainly to light passenger cars, and with this relatively low traffic count, no serious problems arose except for the usual storm damage which occurred each winter.

The logging industry, prior to 1940, depended mainly upon their own railroads to move logs from the woods to sawmills, and very little use was made by them of the county road system. During the war period and the postwar era, there was an ever-increasing demand for lumber. It was to be expected that timber in the back areas would become profitable to cut if an economical means could be found to bring the logs in.

This transportation factor could only be met by hauling over existing roads with the new type of logging trucks developed during that period. The nation-wide demand for lumber and the many thousands of acres of timber in Humboldt County led to a healthy development. The population increased from 46,000 in 1940 to 77,000 in 1951.

Car Traffic Doubled

With an increase in wealth as well as population the number of passenger cars almost doubled from 16,000 to approximately 30,000. Trucks made a phenominal gain in that same period also; from a count of 1,756 to over 6,000. The ratio of passenger cars to trucks decreased from 9.3 to 1 to the present ratio of 4 to 1. This means that there is one truck for every five vehicles on the road today.

In light of these growth factors let us stop and think what effect this tremendous increase in traffic does to our lightly-surfaced, narrow road system. We all know that a heavily traveled road is subjected to a much greater wear and tear than one having a few cars a day. As a consequence many county roads experienced failures in the surfacing whether it be paved or graveled. Poor drainage, and continuous traffic during the rainy season wreaks havoc, causing pavement failures and resulting in numerous and deep chuck holes.

Road Funds Static

Unfortunately, during this growth in traffic, road funds did not increase in the same proportion. For instance in 1940, the road budget was $243,902, and in 1950, $573,888. From a first inspection one would say it appears that the money spent in 1950 was more than double 1940. However, let us consider that the 1940 dollar purchased 76 percent more goods than the 1950 dollars.

Let us multiply $240,200 by 1.76 which would equal $422,753 1950 dollars. This being the case, a simple arithmetic division would then give a very comparative figure.

Money spent per vehicle—1940, $422,753—18,039 vehicles, $23 each.

1950, $573,888—31,989 vehicles, $18 each.

Limited Road Funds

One can readily see that 10 years ago we had a higher amount to spend per vehicle than now. On these same roads, we have doubled the number of passenger cars and quadrupled the number of trucks with an increase in the number of miles of county road to maintain.

Owing to our limited road budget and with increasing costs in wages and materials, it has been necessary to reduce the number of men maintaining the road system during this 10-year period. This is directly opposite to what should have been done. In keeping with progress our manpower should have been doubled.

Let us consider our administration problems. Up until 1947 the county road system was divided into five districts with a supervisor in charge of each district having several foremen under his immediate supervision.

Following the enactment of the Collier-Burns Act in that same year road districts were consolidated under one department head, namely a road commissioner appointed by the board of supervisors; the board to determine policy and approve budget items, the commissioner to administer.

Need Two Assistants

In a county the size of Humboldt it is essential for good organization to have at least two assistants or general

foremen to properly supervise or coordinate the work. This is a reduction of two in administrative personnel compared to the old district organization.

With regard to road funds, the income to Humboldt County is obtained primarily from two sources. The first is from a proration of 1⅜ cents out of a total of 6½ cents gas tax among 58 counties. This proration is made upon a basis of the number of vehicles in Humboldt County compared with the State as a whole. A logging truck is given the same weight as a motor scooter when prorating the funds.

No provision is made for the fact that roads in Humboldt County are more expensive to construct owing to the terrain or to maintain owing to the long rainy season.

A breakdown of the 6½-cent gas tax shows the following: counties, 1⅜ cents; cities ⅝ cents; state highway, 2½ cents; Federal Government, 2 cents.

Forty-cent Limit

From property taxes there is a 40-cent statutory limitation placed upon the amount allocated for road funds. This amount cannot be increased without a change in the state statutes as local control cannot make this change. This means that the road department is limited to 5½ cents to 7 cents out of each county tax dollar collected.

When one considers the low assessed valuation of Humboldt County as compared to its real present-day value it is apparent that this source would not supply very much in the way of funds. Let us compare this average of 6 percent with the figure of 40 percent to 50 percent now going for school funds, 12 percent to 13 percent for the county hospital, and approximately 9 percent for relief. One can easily realize that a very small portion of county taxes are being used for road purposes.

Surfacing Costly

Paving costs, exclusive of grading and widening, amount to approximately $6,000 per mile for a six-inch base with seal coat, and approximately $11,000 per mile for a plant-mixed bituminous surfacing.

From these figures, one may readily observe that with a limited budget it is impossible to show any great improvement in alignment, widening or surfacing.

As traffic continues to grow and costs spiral higher with inflation, the amount of actual road maintenance will perhaps decrease. This condition will naturally present a very difficult problem for those in charge of the road department and the board of supervisors.

What steps then might be taken to alleviate this condition? We might consider a possible revision of the Collier-Burns formula giving consideration to the type of traffic, the mountainous terrain and the long rainy season or we might do what other states and counties have done in solving similar problems.

Revise Tax Limit?

This could be done by a possible revision in the 40-cent limitation on property taxes allowing an increase in percentage for road funds or a severance tax or special license fee for those using the roads for commercial purposes based on the number of ton-miles hauled.

. . . Continued on page 51

This is type of logging traffic to which Mr. Davis refers

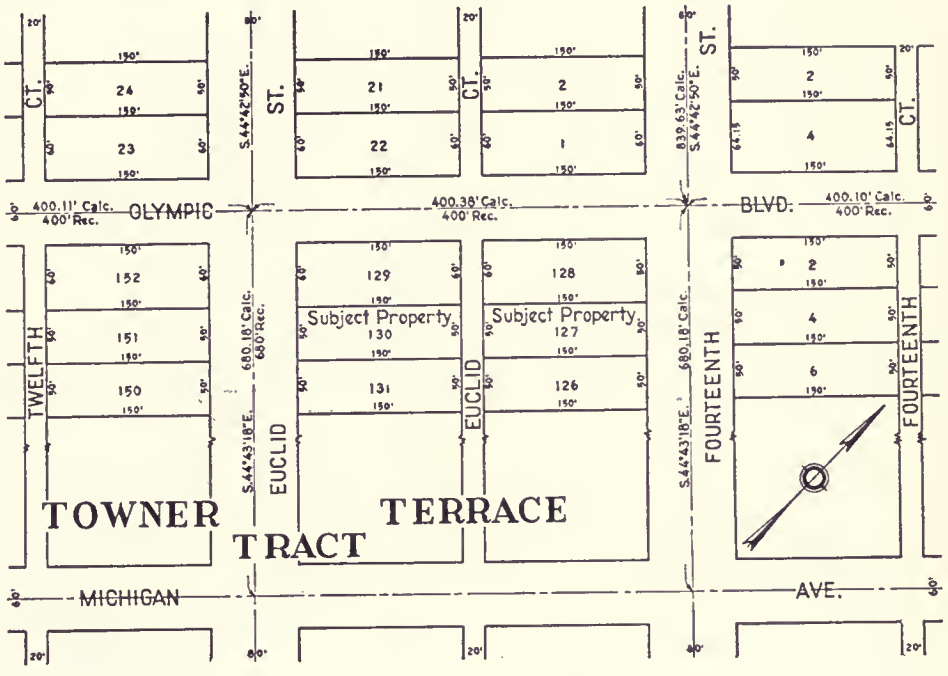


State Victory

Supreme Court Decision Landmark In Litigation Involving Freeways

THE CASE of *Schnider* v. *State of California*, 38 A. C. 492, decided by the California Supreme Court on February 21, 1952, should be of interest to all those concerned with the law applicable to freeways. This case holds specifically that the mere construction of a freeway pursuant to a resolution of the California Highway Commission authorizing the reconstruction of a portion of a highway as a freeway does not create new rights of access in favor of land which did not abut on the highway as it formerly existed.

In the *Schnider* case, plaintiffs brought an inverse condemnation proceeding against the State of California to recover damages for the taking of a claimed right of access to Olympic Boulevard, State Highway Route 173, in the City of Santa Monica. In 1945, the California Highway Commission adopted a resolution authorizing the reconstruction of a portion of Olympic Boulevard as a limited freeway. The location of plaintiffs' property in relation to the surrounding area as it appeared prior to the reconstruction of Olympic Boulevard is shown by the accompanying map.



Case of Plointiffs

In 1947, plaintiffs purchased Lots 127 and 130 which did not abut on Olympic Boulevard until it was subsequently widened for use as a freeway. Prior to that time, Lots 128 and 129, which were acquired by the State from other persons for highway purposes, intervened between plaintiffs' property and Olympic Boulevard. The construction of the freeway was commenced by March 1, 1948, and sometime thereafter the State erected a fence along the common boundary line between plaintiffs' property and the freeway, thereby barring direct access from one to the other.

Plaintiffs obtained a judgment for damages due to a change of grade but the trial court refused to allow plaintiffs compensation for the loss of asserted right of direct access to Olympic Boulevard. From this latter portion of the judgment the plaintiffs appealed.

The sole issue before the court was whether the plaintiffs acquired a right of direct access as a result of the construction of the freeway.

Findings of Court

At the outset of its opinion, the court finds that it is clear from the record that there was no right of direct access to Olympic Boulevard from plaintiffs' Lots 127 and 130 when the resolution of the California Highway Commission was adopted and that such a right did not arise upon the acquisition of the intervening property by the State for highway purposes.

The court finds, in Sections 100.1, 100.2 and 100.3 of the Streets and Highways Code, ample authorization for the construction of a freeway on land where none had existed before without creating rights of direct access in favor of other property which, prior to the new construction, had no such rights of access. In particular, the court points out that the provision of Section 100.3 of the Streets and Highways Code that a declaration creating a freeway "shall not affect private property rights of access, and any such rights taken or damaged within the meaning of Article I, Section 14, of the State Constitution * * * shall be acquired in a manner provided by law," plainly refers to rights of access which exist prior to the establishment of the freeway and not to claimed rights which have no previous existence and which could come into being, if at all, only by virtue of the new construction.

Highway Commission Upheld

As the court states in this regard:

"Where a property owner has no right of direct access to a highway before it is converted into a freeway abutting upon his property, nothing is taken from him by the failure to give him such a right when the conversion takes place. The allowance of compensation in such a case would amount to a gift rather than payment for the destruction of a right."

The court finds that the resolution adopted by the California Highway Commission in 1945 fully complied with the applicable provisions of the Streets and Highways Code and effectively designated Olympic Boulevard

. . . Continued on page 60

Edwin L. Carty New President Safety Council

Edwin L. Carty was elected President of the California Safety Council at the 17th annual state-wide meeting of the accident prevention group in Los Angeles, which saw more than 60 civic and industrial leaders from all areas of the State installed as officers and directors.

"Accidents affect everybody's pocketbook," Carty warned, "since hospitalization of thousands of traffic casualties, increased law enforcement, and higher insurance rates to offset property damage, nick the dollar of the farmer as well as the city man and the salary man as well as the wage earner."

Carty recommended (1) a sharply increased highway construction program to meet California motorists' accelerating demands for more adequate highways and freeways in which all frills may be eliminated; (2) an expanded highway patrol to control traffic flow and properly enforce existing motor vehicle regulations, and (3) widespread training of high school students in the rudiments of skillful driving.

Vice presidents named to serve with Carty for the coming year are Harry Conklin, Vice President, Loyalty Group Insurance; Superior Judge Daniel R. Shoemaker, and Attorney Henry Robinson, all of San Francisco; Dr. Robert Gordon Sproul, President University of California, Berkeley; O. L. Gray, Manager, Santa Fe Railway; Henry L. Gogerty, Architect; Robert A. Moffitt, Attorney; George Worster, Yellow Cab Company President; and Charles C. Reed, inheritance tax appraiser; and of Los Angeles; George A. Scott, San Diego department store executive; and J. D. Grant, Stockton Iron Works.

Re-elected as general counsel was Bernard C. Brennan, a former safety council president. Aaron Riche, also of Los Angeles, was renamed secretary-treasurer. Forty-five directors were also installed at the safety council meeting.

In Memoriam

MICHAEL G. GLEN

Members of the Materials Laboratories at Headquarters and employees of District VIII, were saddened by the death of Michael Gabriel Glen, who passed away in San Bernardino, January 13, 1952, after an illness of seven weeks.

"Mike," as he was affectionately called, was head of District VIII Materials Laboratory, a very competent man in the field of materials research and an interesting and patient teacher of those under his direction.

He was born in Rostov-on-Don, Russia, on September 30, 1899. He received his elementary and high school education at the Tomsk Institute of Technology, Tomsk, Siberia, but was forced to flee to Harbin, China, by the Russian Revolution. In 1923 he came to California with a group of White Russian students. He won scholarships to the Redlands and Pomona Colleges and later transferred to the University of California in order to major in engineering. He graduated in May, 1927.

His first engineering job was on the San Mateo Bay Bridge. In November, 1928, upon completion of the bridge, he went to work for the California Division of Highways, in District VIII, where he served until his death. He became very interested in the materials and research phase of highway engineering early in his career, and organized and set up the testing laboratory for District VIII.

He is survived by his mother, Mrs. Agrippina Gollandskova, and an aunt in Harbin, China; his wife, Florence; and two children, Barbara and Michael.

HIGHWAY DANGER SPOTS

Stay in your own lane on hills and curves and observe the markings on the highway. That's *protective driving*, and it means you'll help avoid a collision with oncoming cars by watching for the danger spots and observing the highway markings that are placed there for your protection.

W. A. S. H. O. Will Meet in June in Seattle

W. A. Bugge, Director of Highways for the State of Washington and President of the Western Association of State Highway Officials, has announced that the Thirty-First Annual Conference of the Western Association of State Highway Officials will be held in Seattle, Washington, at the Olympic Hotel, on June 5, 6, and 7, 1952.

The conference headquarters will be at the Olympic Hotel in Seattle. A sufficient number of rooms have been reserved at the headquarters hotel, and other hotels close to the Olympic have assured us that they will have rooms available for those not desiring to stay at the headquarters hotel. There are four Western Hotels in Seattle for those desiring to utilize their credit cards.

Detailed plans indicate that a most beneficial and enjoyable three days will accrue to the conferees which will include a yacht trip through Lakes Washington and Union, the canal and government locks, Agate Pass Bridge, Puget Sound Naval Shipyard and the Narrows Bridge, ending in a grand smorgasbord at a unique waterfront club in Tacoma.

The formal prereservation plans will be sent delegates the latter part of April W. C. Pedersen, General Chairman, has sent this notice to W. A. S. H. O. members:

"The City of Seattle is celebrating its centennial, and many special events are planned for that week. Whether your hobby be fishing, swimming, mountain climbing—come equipped, for you will find the recreation of your choice in this exhilarating Puget Sound area.

"A special program of interest to the ladies is now being arranged, so make your plans—warn the wife and bring the kids! We are looking forward to entertaining you and making you a part of our third largest industry —tourism."

Of the 4,000 miles of California state highway from which snow is removed each year, only 550 are kept open primarily for recreational traffic.

Concrete Paving

Calcium Chloride Admixture Expedites Opening Pavement to Traffic

By CARL ALZUETA, Assistant Engineer, Construction Department

A section of portland cement concrete pavement was recently treated with calcium chloride on Contract 1-10TC62-F, Sol-7, 8-H,B,A, to accelerate the early strength. From results obtained it appears that this admixture will, in many cases, expedite the opening of the pavement to traffic and is adaptable to the California method of finishing pavement concrete.

Our current specifications and instructions provide that high early strength concrete be obtained by adding two extra sacks of cement to the regular five-sack pavement concrete. Occasionally, because of improper balancing of the ratio of water to cement in the richer mixes, the desired early strength was not obtained. Through the use of small percentages * of calcium chloride, comparable strengths to that obtained from properly designed seven-sack concrete are possible at about one-fifth the additional cost. In addition, the concrete treated with calcium chloride will exhibit lower shrinkage than that characteristic of the richer mixtures.

* 1 to 2 percent by weight of the cement.

Construction Procedure

Flaked calcium chloride was delivered to the job in 100-pound moisture-proof sacks, and spotted at regular intervals on the grade. The admixture was proportioned by filling calibrated containers and added to each batch at the skip. No adjustment in the mixing water was necessary to maintain equal workability.

Since the chemical is an effective accelerator, several minor adjustments may be necessary at times in the normal

. . . Continued on page 32

LEFT—Bags of flaked calcium chloride spotted on the grade. RIGHT—Adding flaked calcium chloride to the mix.



Great Builder

John Hunt Skeggs Leaves Many Monuments Upon Retirement

In the fitting surroundings of old and substantial San Francisco, the friends and associates of Colonel Jno. H. Skeggs gathered at the Fairmont Hotel on March 29, 1952, to render full and richly deserved honors on the occasion of his retirement from state service. Among the several hundred who paid tribute to his career of leadership and achievement were government officials, civic leaders, outstanding builders of public works, and those with whom he was associated in the creation of the California Highway System.

Colonel Skeggs' state career in highway engineering began in 1919 when he accepted an appointment as assistant Division Engineer, Division IV, the predecessor of the present District IV. After being assigned as Acting Division Engineer on July 15, 1921, he succeeded W. Lewis Clark as Division Engineer on the first day of October in the same year. From that date and until the present he has guided the district through the full scope of its labors and accomplishments. While his titles have changed through the classifications of principal highway engineer and metropolitan area highway engineer he has remained for 31 years at the helm of highway development and progress in the vital areas of Central-Coastal California.

Born in Alabama

John Hunt Skeggs was born in Sommerville, Morgan County, Alabama, on March 16, 1882, one of six children in the family of William E. and Celia E. (Bean) Skeggs. The families on both sides were early settlers of the colonies, being among those agriculturists who seasonally drove their livestock from Virginia and the Carolinas to the more favorable forage of the far south. As the gulf lands were thus opened the families settled in the vicinity of the present Huntsville, Alabama, named in honor of one of his forebears.

With such antecedents it followed that Judge Skeggs' children were



COL. JNO. H. SKEGGS

reared in the traditions of the old south. To this day John Skeggs' early training is quite visible except for his departure from the soft southern manner of speech. The seeds of his pre-eminent devotion to honor and integrity were sown in this land of his early youth.

Takes Up Engineering

After completing his primary education in the public schools of Decatur, Alabama, he entered Alabama Polytechnic Institute, probably better known in California as Auburn. In the language of our more familiar pattern of higher education, Auburn administrates the Colleges of Agriculture and Mechanics while the Liberal Arts and allied colleges are centered in Tuscaloosa.

Since there was no background of engineering in his family, one wonders at the colonel's selection of the civil course. He recalls that in his younger days he was committed to the responsibility of managing his own future and, enjoying the out-of-doors, the activities of a civil engineer appealed to him. Moreover, having stumbled over the many survey stakes which dotted the campus, he decided to leave a few monuments to his own residence.

As a student, his athletic interest lay in football. John Skeggs is unique in that he submits no claim to All-American selection, preferring to recall that the varsities of the nineties were expected to be students as well as athletes, and it is pleasant to note that he graduated with honors. He still follows the fortunes of the Orange and Blue, quite actively too, for he was largely responsible for the Santa Clara-Auburn game of 1936.

After graduation he joined the Alabama Railway forces as a topographer on preliminary and location surveys. Leaving this work he became a tax expert with the Alabama Title Guarantee Company, the only interlude in his long career of civil engineering.

On Los Angeles Aqueduct

The year 1903 found him returned to engineering and far from his native Alabama. For five long years he mounted the slow steps to chief-of-party with the Pacific Electric Company of Los Angeles. After a brief period of titular splendor as City Engineer of Covina, opportunities came in the building of the Los Angeles Aqueduct through Inyo and Kern Counties. Of all his early experience this task seems to have afforded him his greatest opportunity for young adventure. While it may be that the hardships of this pioneer endeavor have grown in stature through the years, Colonel Skeggs can always trump any leisure hour story of early engineering by reciting one of his own adventures on the aqueduct.

At the conclusion of this project, in 1909, he assumed the duties of Deputy County Surveyor of Los Angeles County, and for five years remained in charge of field work on road and bridge location as well as construction. In this assignment he met many of his future associates, notably Spencer V.



Speakers' table at dinner tendered Col. Skeggs. LEFT TO RIGHT—Director of Public Works Frank B. Durkee, Col. Skeggs, State Highway Engineer Geo. T. McCoy, Assistant State Highway Engineer B. W. Booker, Deputy State Highway Engineer R. M. Gillis, Fred Grumm, retired deputy state highway engineer, Ray Duffy, assistant district engineer, District Highway Engineer L. A. Weymouth.

Cortelyou, whose career with the Division of Highways closely paralleled his own in its magnitude and responsibility.

Goes to War

His next position was with the Los Angeles County Road Department where he doubled as Construction Engineer and Maintenance Engineer. A brief interlude with the U. S. Bureau of Public Roads brings his career to 1917, the year of the first World War. Colonel Skeggs immediately entered the military service as a Captain in the Corps of Engineers, U. S. Army. Through the rank of major and later lieutenant-colonel he participated in the memorable Saint-Mihiel and Meuse-Argonne offensives.

Returning to civil life at the conclusion of the war, John Skeggs entered the service of the State of California, beginning a career which was to leave its provident marks on the face of California in the form of highways, developed and constructed in a manner which has brought to him the highest honors of his profession.

Notable Achievements

To record the eminent achievements of Colonel Skeggs during the 31 years of his administration would be to recite the history of the district. The projects conceived and executed have materially affected the life and activity of the metropolitan area surrounding San Francisco Bay. Lines of communication which he created have determined many of the present centers of population, and have opened new horizons of better and more comfortable living to countless thousands.

Confronting him in his first years of responsibility was the lack of approach from the only land connection to the city of San Francisco. The old two-lane El Camino Real, which followed the route of the early Spanish explorers, had become saturated with the growing automobile traffic. Surveys had started on the present Route 55, the Skyline Boulevard, in 1919, and he immediately devoted his energies toward its completion. By 1928 it had carved its way on the face of the ridge running southerly and parallel to the coast, to the point known as Saratoga Gap. The colonel's interest in this job and his vigorous leadership towards its early and successful completion are pleasingly commemorated in the naming of Skeggs Point, a beautiful turnout which presents a full panorama of the land which the Skyline serves.

Birth of Freeways

To further relieve the situation, Route 68, the Bayshore Highway, was conceived, and is now becoming one of the foremost freeways in the country. Realignment and widening of El Camino Real came into being, and it is interesting and significant to note that the section near Colma foretold the

coming era of divided highways. In all his early building Colonel Skeggs, with the then limited means at hand, sought to control access to his creations. While the word "freeway" was unknown his foresight in restricting entry became the essence of modern freeway construction.

One of the most noteworthy of his engineering accomplishments was the treatment of the Valona Slide. This seemingly uncontrollable movement harried the southern approach to the Carquinez Bridge, at the same time interfering with the mainline railroad at its base. The problem called for original thinking, and in cooperation with the railroad engineers a complex system of subterranean drainage was evolved. He devised the huge surface of interlocked and independently anchored concrete slabs which cover the face of the huge cliff above, diverting the lubricant which actuated the slide. The cliff is now reminiscent of the watersheds of old Gibraltar supporting that waterless and isolated peninsula.

Some of His Projects

Noteworthy also in his achievements were the replacing of the Pacheco Pass wagon trails, and the Altamont realignment, opening the way for the coming flood of wheels from and to the South and East. Here John Skeggs conceived and developed the process of dust oiling, adding immeasurably to the comfort of drivers and roadside inhabitants.

Perhaps one of the most pleasant accomplishments in the minds of thousands who yearly visit the vacation area of Santa Cruz, was the rebuilding of the Los Gatos-Santa Cruz Highway. Those who followed the old bumper to bumper trail through Holy City many times have had occasion to thank those who brought it into being. In more recent years and close to this area, Colonel Skeggs was first able to put teeth into his plan of controlled access on the Watsonville-Rob Roy section of Coast Route 1.

Monuments to Col. Skeggs

It would be difficult to select any one of his accomplishments to serve as a lasting monument to his generation of outstanding engineering achievements. Each one had its own importance, varying only in the purpose which it served. However, with respect to magnitude and endurance, and to its impact upon the manifest destiny of this Bay area, the location and construction of the approaches to the San Francisco-Oakland Bay Bridge and the Golden Gate Bridge, linked as they are to the Eastshore Freeway, Waldo and 19th Avenue, will make forever memorable the career of John H. Skeggs. The results of his work are countless and endless. Opening the Lake County recreation area with the road from Calistoga north, the Russian River realignment from Cloverdale to Hopland, McDonald to the Sea, the elimination of the Corte Madera grade, are but a few of the projects which have left their imprint on transportation in this area.

One might summarize the lasting contributions he has made to highway engineering by recalling (1) the three major tunnels in the district, Broadway Low Level, Waldo, and Funston; (2) his pioneering in the field of divided highways and center-striping; (3) his unending and successful battle to control access rights and, (4) the 1,300 miles of outstanding state highways in this district, all of which were built or rebuilt under his direction.



Col. Skeggs, right, receives from his successor, B. W. Booker, keys to auto presented to him as parting gift

In completing his tasks with the Division of Highways it must be a source of pleasant satisfaction for him to recall the division office in its few small rooms in the Rialto Building, and its growth through the phases of the Flood Building, the State Building, the Headquarters at Van Ness and Jackson, and finally the present building, planned to meet the needs of an operations and design force of 750 men and women. Colonel Skeggs gave careful attention to its functional design and construction, determined that these quarters would reflect the wisdom of so many years of administration. The building now stands as a beautiful landmark representing progress in the field of transportation during this first half of the century.

USING THE HAND BRAKE

In freezing wet weather the use of the emergency brake is not advisable when parking because it may freeze and then cannot be released. Use the car's gears as a parking brake and turn the wheels into the curb on hills.

B. W. Booker

Appointment of B. W. Booker as Assistant State Highway Engineer in charge of the District IV office of the Division of Highways in San Francisco was announced by State Highway Engineer George T. McCoy, effective on the retirement of Jno. H. Skeggs on April 1, 1952.

The last 10 years of Mr. Booker's 30 years of service with the Division of Highways have been spent in the San Francisco office, as Assistant District Engineer and, beginning October 3, 1947, as District Engineer.

A native of Topeka, Kansas, Mr. Booker moved to San Francisco as a boy and took his civil engineering studies at the University of California. After several years of varied experience with the Southern Pacific, the San Francisco Harbor Commission and the Interstate Commerce Commission, he joined the State Highway organization in October, 1921, as a draftsman. His first assignment was to a survey party in Lake County.

He served as office engineer, locating engineer and construction engineer in four different districts of Northern and Central California before his assignment to District IV in 1942.

During his career with the Division of Highways, Mr. Booker has had responsibility for surveys, design, construction, maintenance and administration in many different areas of the State. In particular, he has had considerable experience in slide and slip-out correction work in heavy construction areas.

He has been responsible for much of the planning of metropolitan freeways and bridge approaches in the San Francisco Bay Area. He was responsible for the compilation of the Preliminary Traffic Report on Proposed San Francisco Bay Crossings and the San Francisco Metropolitan Bay Area Traffic Report.

The snow-removal season on California state highways runs from October until the opening of the higher mountain passes in June.



B. W. BOOKER



JOSEPH P. SINCLAIR

SHOWING OFF

The next time you feel the urge to show off when behind the wheel of a car, warns the National Automobile Club, remember that it takes but a split second, but a panic-stricken moment of confusion, to switch from spectacular driving to spectacular death.

Joseph P. Sinclair

Joseph P. Sinclair was born January 23, 1920, in Minneapolis, Minnesota, and received his schooling in the Los Angeles area. He graduated in 1932 from the University of Southern California, receiving a Bachelor of Science Degree in Civil Engineering.

Mr. Sinclair entered state service in July, 1932, as a Junior Engineering Field Aid with District VII at Los Angeles, and was assigned to surveys in the San Diego area.

In April of 1933, Mr. Sinclair left state service to accept employment with the Los Angeles Metropolitan Water District, with headquarters at Banning, California, where he was employed on construction of the Los Angeles aqueduct.

In October of 1933, two months after District XI was formed with headquarters in San Diego, Mr. Sinclair returned to state service and remained with that district until January 1, 1950. During that period he received wide experience in design, city and county cooperative projects, laboratory, maintenance, project reports, and budget fields. In the last 10 years with District XI, Mr. Sinclair served as Assistant District Maintenance Engineer, Project and Budget Engineer, and Design Engineer.

From 1943 until the end of 1945, Mr. Sinclair was an officer in the U. S. Navy, serving with a naval construction battalion as executive officer in charge of construction of bases in the western Pacific. He was released from active duty with the rank of Lieutenant Commander in December, 1945.

In January, 1950, Mr. Sinclair was promoted to Assistant District Engineer—Design-in District VII, and he has served in that capacity until named to succeed Mr. Booker in District IV. This assignment has included supervision of freeway design in the Los Angeles Metropolitan Area, as well as varied types of construction in the Ventura County section.

New Fields

Hal Norton Retires to Enter Private Business

ONE OF THE most widely known men in state service and a colorful figure in California public life for more than two decades, Harold P. Norton, Special Representative of the Department of Public Works, retired on March 1st.

Norton has formed a partnership with Mr. Albert Criz, a prominent Los Angeles architect and the firm name will be known as Albert Criz and Associates, an architectural and engineering firm with offices in Los Angeles and has opened an office in San Francisco as a joint venture with Ralph Phillips, one of the outstanding mechanical and electrical engineers in the State of California, for the design of all types of buildings and structures, specializing in government and industrial projects.

Appointed by Governor Young

Norton first became a state employee in 1929 when he was appointed by Governor C. C. Young to be an investigator and prosecutor for the State Pharmacy Board. He resigned in May, 1931, and went into the produce business in Stockton but returned to public service in September of that year, when he was appointed secretary of the civil service board of the City of Sacramento. He held this position until December 1, 1932, and was named Sergeant-at-Arms of the Assembly for the 1933 Session of the Legislature. During that session, Norton was active in obtaining enactment of the Riley Tax Plan. At the conclusion of the session he accepted an appointment with the State Board of Equalization and held that position until February 1, 1934, when Director of Public Works Earl Lee Kelly named him Chief of the Traffic Survey in the Division of Highways. This survey, which was carried on as a WPA project, was the first of its kind to be initiated in the United States, and created the nucleus of traffic data which later proved invaluable in the building up of the modern State Highway System.



HAROLD P. NORTON

In the latter part of 1934, Kelly appointed Norton as his personal assistant with the title of special representative of the Department of Public Works, a post he has held continuously since that time.

Named Special Representative

One of Norton's duties was to represent the Department of Public Works in legislative matters. During the 1935 Session of the Legislature, he initiated through Assemblyman Charles Stream and the late Senator Thomas McCormack studies for the improvement of state, county, and city highway systems.

Norton took an active part in the long fight to provide more adequate finances for the State Highway System and is credited with having done much to obtain enactment of the Collier-Burns Highway Act of 1947.

He initiated studies on the Richmond-San Rafael Bridge now being constructed, on the Benicia-Martinez Bridge, and on the proposed tube across San Diego Bay between San Diego and Coronado.

Various Activities

In 1943, Norton initiated a future highway planning program, which resulted in legislative appropriations from the General Fund for highway planning by counties and cities. This program made it possible for the Division of Highways to launch an extensive highway construction program immediately following the end of World War II.

In cooperation with Senator George J. Hatfield, Norton was helpful in obtaining passage of legislation creating the University of California Institute of Transportation and Traffic Engineering in 1949.

Norton was born in Chicago, Illinois, in 1897. He came to California with his parents in 1900, attended Sacramento public schools, and was graduated from Sacramento High School in 1914. He is a veteran of World War I, a member of Sacramento Post 61, American Legion, and vice chairman of the Rehabilitation Fund, Department of California, American Legion. He is also a member of the Hibernians, Knights of Columbus, YMI, Independent Order of Foresters, and Serra Council. Norton is married and has two children and three grandchildren.

READ IN AZORES

HORTA, AZORES

California Highways and Public Works

DEAR SIRS: A friend, who lives in Fresno, sent me a few numbers of your excellent publication where highway problems and their actual solutions are presented in such a manner that they deserve the best attention of all highway engineers.

I think it will be very useful to read every number of *California Highways and Public Works*, and therefore I ask you to kindly include my name on your mailing list.

Sincerely yours,

FREDERICO MACHADO
(District Engineer of Public Works)

Retirements *from* Service

ONE HUNDRED years of service! That is the combined record of C. P. (Monty) Montgomery, E. L. (Slim) Seitz, and T. C. (Pete) Peterson. All three of these men announced their retirement from the Division of Highways, District VII, during the month of February, 1952. Monty, with 40 years' service, and Slim, with 35 years, are the old timers. Pete, with a mere 25 years, is the youngster in point of years served.

On February 28, 1952, over 120 of their friends met to honor their achievements and to wish them well. After-dinner ceremonies were MC'd by Assistant District Engineer Frank B. Cressy. Paul O. Harding, Assistant State Highway Engineer, presented Monty, Slim, and Pete with scrolls bearing the signatures of their friends and associates. Bill Fahey, District Engineer, added his sharp wit in the presentation of gifts—a beautiful, solid gold Hamilton watch to Slim; a power mower to Monty to help keep him and his lawn in trim; and a complete deep sea fishing outfit to Pete with which to follow his favorite hobby.

Seated at the table of honor with Monty, Slim, and Pete were two other retired members of the Division of Highways, Spencer V. Cortelyou and Ned Gripper. The names of these two gentlemen appear on the first District VII, February, 1912, pay roll, along with that of C. P. Montgomery. Walt Cannon and Chuck Parker, both recently retired, as well as Jim Lackey and Doc McNeely, joined in the opportunity to extend a friendly hand and recount past experiences. The contracting firms of Cox Bros., Vido Kovacevich, Haddock Bros., and Griffith Co. were also represented at the festivities.

C. P. Montgomery

FEBRUARY 15, 1952, marked the retirement of the last of District VII's "charter members." On that date Cranston P. Montgomery completed 40 years of service with the Division of Highways, all with District VII. As one of the 20 employees whose names appeared on the first pay roll, Monty soon became one of the key men around which the district construction organization was built. Forty years later, as one of 921 staff employees, Monty was still giving a full measure of service to the Division of Highways.



C. P. MONTGOMERY

Born on February 4, 1886, Monty received his formal education in the public schools and the University of Kansas. After serving with the Los Angeles County Highway Commission, he joined the California Division of Highways on February 15, 1912.

His first assignment with the State was as Instrumentman on the location of Route 2 through Newberry Park.

. . . Continued on page 28

T. C. Peterson

RETIREMENT in February, 1952, ended 25 years with the Division of Highways for T. C. Peterson. Starting with the State at San Luis Obispo, he later transferred to District VII where he has served continuously since January, 1929.

Pete is a native of Nebraska and was educated at Grinnell College where he received his B.S. degree in 1911, with Phi Beta Kappa honors, and the University of Nebraska, B.S.C.E., 1914. Leaving college in April, 1914, Pete roamed most of the western states from California to Nebraska locating highways for the Bureau of Public Roads. In 1914, as Chief of Party, he shot topography in Yosemite Valley, California, and located highways in Glacier National Park, Montana. Out of Lander, Wyoming, in 1917, he located the road across the Continental Divide into the Jackson Hole Country.



T. C. PETERSON

. . . Continued on page 28

Ernest L. Seitz

ERNEST L. SEITZ has spent a very active career in the improvement of his native California. First employed by the San Diego and Arizona Railroad in 1916, he has since served the Orange County Road Department, Los Angeles County, and Districts III, VII, and VIII of the Division of Highways. His service with the State was continuous from 1917 except while on overseas military duty in World War I and while on loan to the Navy as a resident engineer on airfield construction in World War II.



ERNEST L. SEITZ

Starting with preliminary location surveying on the Feather River Highway in July, 1917, Slim had experience in all of the engineering phases of highway construction. With District VII since August, 1930, he has served as Resident Engineer on numerous large road contracts. An inveterate gadgeteer, he developed, among other items, a device for marking high spots

. . . Continued on page 28

Montgomery

Continued from page 27 . . .

In December of 1912, Monty was assigned to Construction as Assistant Resident Engineer. He was promoted in 1917 to Resident Engineer and stationed at Pine Valley in San Diego County. Monty served as Resident Engineer with the Construction Department until 1947, when he was made Field Supervisor over many Resident Engineers. In this capacity he patiently passed on to young engineers the benefit of his many years of highway engineering exerience.

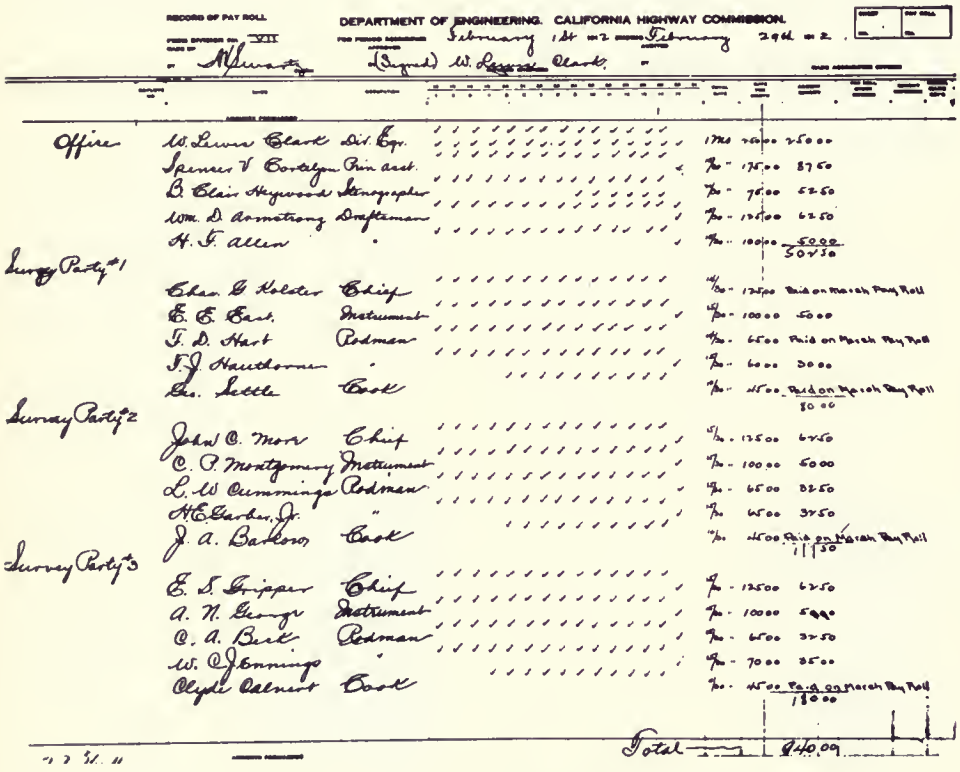
Truly, Monty and District VII have "grown up" together. They saw two-lane highways in Southern California expand into the vast network of multi-million dollar freeways which are described in this issue by P. O. Harding.

Peterson

Continued from page 27 . . .

Pete served as Assistant Resident Engineer and Resident Engineer on state highway paving contracts. His long experience in highway construction work made him one of the State's foremost asphalt paving hot plant experts. Although the 10 years preceding his retirement were largely spent in the district office, he frequently was called on to aid in getting asphalt concrete paving jobs under way.

In the 23 years Pete has been in District VII, most of the time in the Construction Department, his friendly disposition and dry wit have made him a host of friends who hope his retirement will be a long and pleasant one.



RECORD OF PAY ROLL

DEPARTMENT OF ENGINEERING. CALIFORNIA HIGHWAY COMMISSION.

For Period Beginning February 1st 1952 Ending February 29th 1952

(Signed) W. Lewis Clark, Clerk

Office	W. Lewis Clark	Dist. Eqr.	1/12	208.00	250.00
	Spencer V. Costelyn	Pin. asst.	1/20	175.00	87.50
	B. Clair Heywood	Stenographer	1/20	76.00	52.50
	Wm. D. Armstrong	Draftsman	1/20	126.00	62.50
	H. F. Allen	"	1/20	100.00	50.00
					302.50
Survey Party #1	Chas. G. Holder	Chief	1/20	125.00	Paid on March Pay Roll
	E. E. Bast	Instrument	1/20	100.00	50.00
	T. D. Hart	Rodman	1/20	65.00	Paid on March Pay Roll
	F. J. Hauptmann	"	1/20	60.00	30.00
	Chas. Little	Cook	1/20	45.00	Paid on March Pay Roll
					80.00
Survey Party #2	John C. Moore	Chief	1/20	125.00	62.50
	C. P. Montgomery	Instrument	1/20	100.00	50.00
	L. W. Cummings	Rodman	1/20	65.00	32.50
	H. E. Barber, Jr.	"	1/20	65.00	32.50
	J. A. Ballard	Cook	1/20	45.00	Paid on March Pay Roll
					111.50
Survey Party #3	E. S. Gripper	Chief	1/20	125.00	62.50
	A. N. Gregg	Instrument	1/20	100.00	50.00
	C. A. Burk	Rodman	1/20	65.00	32.50
	W. C. Jennings	"	1/20	70.00	35.00
	Clyde Calmer	Cook	1/20	45.00	Paid on March Pay Roll
					180.00
				Total	940.00

Seitz

Continued from page 27 . . .

in asphaltic surfacing. For some time Slim's bump marker was standard equipment on most asphaltic concrete paving jobs in the district.

Slim's interest in mechanics and gadgets promises to keep him pleasantly and actively employed during his retirement.

GREAT ENGINEERING EXHIBIT TO MARK CENTENNIAL EVENT

With the American Society of Civil Engineers spearheading the plans, it is anticipated that 25,000 engineers of all branches, representing 51 American and foreign engineering societies, will meet at the 11-day Centennial of Engineering in Chicago, September 3 to 13, 1952.

Charles E. Thorp

CHARLES E. THORP, Purchasing and Requisition Clerk, of the Division of Highways, Service and Supply Department, retired on April 1 after 34 years of state service, 32 of which have been with the Division of Highways.



CHARLES E. THORP

Mr. Thorp was born in Lancashire, England, and was induced to visit California by his uncle, who was then President of Weinstock, Lubin and Company in Sacramento. Mr. Thorp was properly initiated to California by being in San Francisco at the time of the big earthquake in 1906.

He first started work as a draftsman with the Department of Engineering, but in 1920 transferred to the Purchasing Department of the California Highway Commission, which was then in the Forum Building, Sacramento.

Mr. Thorp soon became Purchasing Agent Grade III and General Buyer Grade 4, and was appointed Assistant Purchasing Agent, under Lowell R. Smith, of the California Highway Commission. Mr. Austin B. Fletcher was at that time the State Highway Engineer. Prior to 1927, the Division of Highways was purchasing $2,000,000 worth of materials annually as compared with $5,500,000 purchased for the entire State, not including highways.

In 1926, all state purchasing was centralized under the Department of Finance, and Mr. Thorp was reclassified as a Purchasing and Requisition Clerk for the Division of Highways, and has held that title since 1927.

After retirement, Mr. Thorp plans some extensive gardening, taking care of his many camelias and azaleas as well as his beautiful rose garden.

He and Mrs. Thorp plan to do some traveling and hope to go to Yellowstone Park, and points east, west, north and south.

Thomas J. Whalen

On January 1, 1952, Thomas Joseph Whalen retired after thirty years of faithful service with the Division of Highways, Maintenance Department in District V. He was born in Castroville, California, November 1, 1891, where he received his formal education. Between 1908 and 1915 he was employed on ranches near Castroville, Monterey and Gonzales, and from 1915 to 1918 was a hotel proprietor at San Lucas. He served with the A. E. F. in France during World War I. He began work with the Division of Highways in 1919 as laborer-teamster in the Maintenance Department in Monterey County. In 1920 he was promoted to sub-foreman and later the same year to foreman which position he held until retirement.



THOMAS J. WHALEN

Mr. Whalen was employed continuously in the Maintenance Department in District V with the exception of two years in 1943 to 1945 when illness prevented his working. From 1945 to date of retirement, he was located in the Cuyama area in Santa Barbara County.

Mr. Whalen was especially popular with the men under his supervision. He was very methodical and neat in all of his work and maintained warehouses and yards under his supervision in a very orderly manner. He was very expert in placing emulsion patches and seal coats, being considered one of the best men in the State on this work.

Mr. Whalen has two married daughters. One lives at King City and one at Soledad. Mr. Whalen and his wife, Mrs. Edith M. Whalen, are making their home at King City.

During an ordinary winter, the California Division of Highways clears snow from some 4,000 miles of state highway at an average cost of $1,500,000.

Lloyd A. Batham

On February 29, 1952, Lloyd A. Batham, Associate Highway Engineer with the Division of Highways, District IV, retired after 38 years of State service.

Mr. Batham started his engineering career in 1905 as chainman for the City of Chico. After leaving the city position in 1909, he was an engineer for the Richvale Land Company and the Sierra Electric Power Company, and in 1910 returned to Chico as Assistant City Engineer. Working until 1912 in that position, he accepted employment with the Northern Electric Railroad Company as Assistant Engineer. After two years in railroading, he went to work for the California Highway Commission in 1914, the Division of Highways not being in existence at that time.



LLOYD A. BATHAM

His first assignment was in Headquarters Office as a draftsman, at which position he worked until 1918, when he transferred to Division IV office in San Francisco. After a short time, he was appointed chief draftsman, working under the direction of W. Lewis Clark, Division Engineer, who was succeeded in 1921 by Jno. H. Skeggs, later District Engineer and Assistant State Highway Engineer. Mr. Batham served as chief draftsman for 24 years and in 1942 was appointed Assistant District Planning Engineer, a position he held until his retirement on February 29, 1952.

On the night of February 21, 1952, over 100 co-workers gathered at the Montclair Restaurant to honor Lloyd on the occasion of his retirement. R. P. Duffy, Assistant District Engineer, acted as master of ceremonies and a shotgun was presented to Lloyd by Colonel Skeggs on behalf of his friends. Among the speakers was Paul O. Harding, Assistant State Highway Engineer, District VII, who flew from Los Angeles to be with his good friend and former co-worker.

Lloyd plans to do a lot of fishing and hunting during his retirement. His son, Lloyd Batham, Jr., is an Assistant Highway Engineer in District III, and they expect to have many trips together in the Sierras.

Roy C. Teel, Sr.

Roy C. Teel, Sr., veteran state highway right-of-way agent in District V, San Luis Obispo, has announced his retirement from public service effective April 1, 1952.

Formerly in the real estate business in Los Angeles, Mr. Teel joined the Division of Highways on February 21, 1931, as a construction camp clerk and transferred to right-of-way work in San Francisco November 1, 1935. In 1944 his duties took him to San Luis Obispo where a year later he was designated district right-of-way agent.



ROY C. TEEL, SR.

Illness in the summer of 1948 necessitated his relinquishing this post but he remained actively engaged in right-of-way work as administrative assistant. He was particularly instrumental in the training of new agents, many of whom gathered to honor him at luncheon January 31st and again, along with other district employees, at a testimonial banquet at the Anderson Hotel, San Luis Obispo, on February 8, 1952.

Mr. Teel plans to return to the Los Angeles area and make his future home in Whittier, where he admits he will probably again engage in some phase of real estate activity.

Following in his father's footsteps is Roy C. Teel, Jr., an assistant right-of-way agent in the Los Angeles office of the Division of Highways.

Charles H. Ryon

APRIL 1, 1952, saw the close of a long career in public service and the beginning of a well-earned retirement for Charles H. Ryon, chief clerk, Equipment Department, Division of Highways, Sacramento.

Thirty-eight years ago, on September 11, 1914, Charles embarked on a career which has been at once satisfying, interesting and richly filled with lasting friendships made along the way.

He was born in the town of Marysville, on September 19, 1886; the son of Edwin Ryon, an expert cabinet maker, and Georgia Carey Ryon.

Shortly after Charlie's birth, the family moved to Chico, where his father became Bridge and Building Superintendent for the Sacramento Northern Railroad. There Charlie received his education and planned his life. He graduated from high school and took a post-graduate course in stenography and commercial law.

At Chico Normal

Charlie's first position, which he held while still in his last year of school, was that of secretary to Dr. Van Liew, then President of Chico State Normal School and also President of the California State Teachers' Association at that time.

In 1911, he left Chico and moved to Sacramento to live, where he was secretary to Mr. Gustave York, President of Hall, Luhrs and Co., wholesale grocers of that time. It is said that Charlie established a record in the selling of hams that has never been equaled.

In 1914, he took the first and only examination for "chief clerk" given by the State of California and on September 11, 1914, he entered the service of the newly formed Division of Highways, it being only two years old at that time. He was appointed to the position of clerk under Lowell R. Smith, Chief Clerk of District III with offices in the Forum Building. The late Wm. S. Caruthers was at that time the Division Engineer of District III.

The personnel of the office in the Forum Building consisted of only three or four, including the Chief Clerk, and many were the extra hours of hard labor that Charles Ryon and Lowell Smith were called upon to give to the cause.



CHARLES H. RYON

On June 30, 1917, Charlie married Ethel Katherine Doyle, the daughter of the publisher of the Marysville *Democrat*. Mrs. Ryon has shared 35 of Charlie's 38 years of service to the people of California. Mrs. Ryon is now a retired schoolteacher.

Goes to District IV

In 1918 he was transferred to District IV as clerk and stenographer to the late James Moriarity, Chief Clerk. Lewis G. Clark was then District Engineer, preceding Col. Jno. H. Skeggs.

Ryon returned to District III Office at Sacramento in 1919 and in 1920, he was appointed Chief Clerk, Lowell Smith having left the district some time before, later becoming Purchasing Agent with the Department of Finance.

Among those whose highway career began with District III was Tom H. Dennis, then a Resident Engineer and later Highway Engineer, Clyde Rust, once office boy and now Maintenance Superintendent, John Stillwell and Walter Riechel, now Superintendents of Equipment, Tom Mendenhall, now Headquarters Shop Truck Department Foreman, and many others.

In 1922, Ryon went to Central Office for six months under Herman Weaver, and on August 13th, he was appointed Chief Clerk of the newly-formed Equipment Department under R. H. Stalnaker.

He served under Mr. Stalnaker, saw him retire, and Mr. Earl Sorenson assume charge of the department. He has never faltered in his efforts to continually improve the effectiveness of his organization.

Frank L. Holt

AFTER 34 years of service with the Division of Highways, Frank L. Holt has retired. He had a varied career driving stage out of Truckee to Independence Lake and Sierraville Valley, driving logging teams, largest of which were 14 head in one string—10 horses and 4 oxen; and working for Southern Pacific at Gold Run as Station Engineer Fireman. He started to work for the Division of Highways in 1917 in District I Engineering Department.

The District Engineer was Mr. Somner, Assistant Engineer Haselwood, Survey Party Chief Fred Bolles, and Field Boss, J. W. Vickrey. In 1925 he went to Carnelian Bay, Lake Tahoe, in District III, under Superintendent C. H. Weeks. In April of that year he drove over Echo Summit over four feet of frozen snow in a Dodge screenside truck.

In 1926 he transferred to Maintenance and worked throughout the district, spending 15 years in the Truckee territory, most of the time as leadingman. He transferred to Marysville in 1944 and retired on February 29, 1952.

FROM CAL TECH

MR. GEORGE T. MCCOY
State Highway Engineer
Sacramento 4, California

DEAR SIR: I ran across a copy of *California Highways and Public Works* in our civil engineering library here at Cal Tech recently. I was quite interested in the magazine, as it keeps well abreast of the times and brings to me, an undergraduate civil engineer, a look into what we can expect to be doing when we graduate. It also shows that what we are learning can be useful on the outside.

Sincerely yours,

PHILIP K. BATES, JR.
Pasadena, California

In Memoriam

CLYDE F. LANGWORTHY

Previously unreported in *California Highways and Public Works* was the loss of Clyde F. Langworthy, who died suddenly last year while serving as resident engineer for the now completed relocation of State Sign Route 150 in the vicinity of the Cachuma Reservoir in Santa Barbara County. At the time of his death, he had served the State of California for nearly 20 years.

Born in San Antonio, Texas, on February 23, 1900, Mr. Langworthy studied civil engineering while in the military service during and shortly after World War I, and later attended the University of Texas. After working as a draftsman with various private concerns and then the City of Burbank, he first joined the Division of Highways staff in September, 1927, at Redding. He subsequently worked in District III (with its headquarters then in Sacramento) and District I, moving in 1941 to District V, where he remained until his death.

He is survived by his widow, Mrs. Odette Langworthy, whom he married in 1936, and by seven daughters and a son.

HIGHWAY WORKERS DESERVE PRAISE

It's a good thing to note when an official agency does a good job, and the State Division of Highways has done just that in keeping roads open after the recent snowstorms in the hills.

It has been a gigantic task, but the Division of Highways has kept traffic moving despite terrific snow problems. Some of the highway crews were moving snow 24 hours at a clip during the worst falls in the mountain areas, and they managed to keep the main roads passable most of the time.

Taxpayers got their money's worth and more from the efficient and loyal service of the highway personnel during the recent emergency. Good work.—*Los Angeles Mirror*, March 13, 1952.

In Memoriam

BURTON W. HUBBARD

Burton W. Hubbard, a member of the staff of District VII, Division of Highways, for almost 24 years, died March 2, 1952, at the Queen of the Angels Hospital in Los Angeles after a short period of illness.

Hub, as he was known to his many friends, was born December 23, 1905, at Belmond, Iowa, attended grammar and high schools at Durango, Colo., and later majored in geology at the University of Colorado at Boulder. He entered the employ of District VII June 25, 1928, as a chairman on survey party, after having worked for the Colorado Highway Commission and for the County of Los Angeles.

For a few months during 1933 and 1934 Hub worked for District V at San Luis Obispo and for the San Francisco-Oakland Bay Bridge. Except for these short periods, his military leave for naval service in 1942, and for the winter of 1947 when he was Resident Engineer under the United States War Department on the project of rehabilitating war-damaged highways in Greece, his engineering career with the Division of Highways has been in District VII.

Hub had a very well-rounded experience in highway engineering, having served in all survey party positions and acted as survey party chief. He also served as assistant resident engineer on construction and as squad leader in drafting room design. This broad experience made him very valuable in the position which he held from April, 1948, to the date of his death. As assistant district office engineer he handled, among other duties, the contacts with the public in connection with state highway activities and the extensive freeway developments in the Los Angeles area.

Hub's immediate family consists of his widow, Margaret, who resides in Santa Ana, and his son, Lee, who graduated with honors from Santa Ana High School, winning a scholarship to the University of Chicago. He is now attending this university, majoring in anthropology.

Hub's passing is a loss to the State Division of Highways and a cause of sorrow to his host of friends.

In Memoriam

JOHN O. MILLER

John O. Miller is dead. His memory will long be revered in the State Department of Public Works.

Mr. Miller was a supervising hydraulic engineer of the Division of Water Resources at the time of his sudden death in Sacramento from a heart attack on March 7, 1952. He entered state service in April, 1938, as an associate hydraulic engineer. He advanced to senior hydraulic engineer on July 1, 1946, and on August 1, 1950, was promoted to his latest post.

A graduate from Stanford University in 1912, with a C. E. degree, Mr. Miller engaged in varied engineering practice until 1917 when he entered the Army and was commissioned second lieutenant, U. S. Army Engineers, serving for two years during World War I.

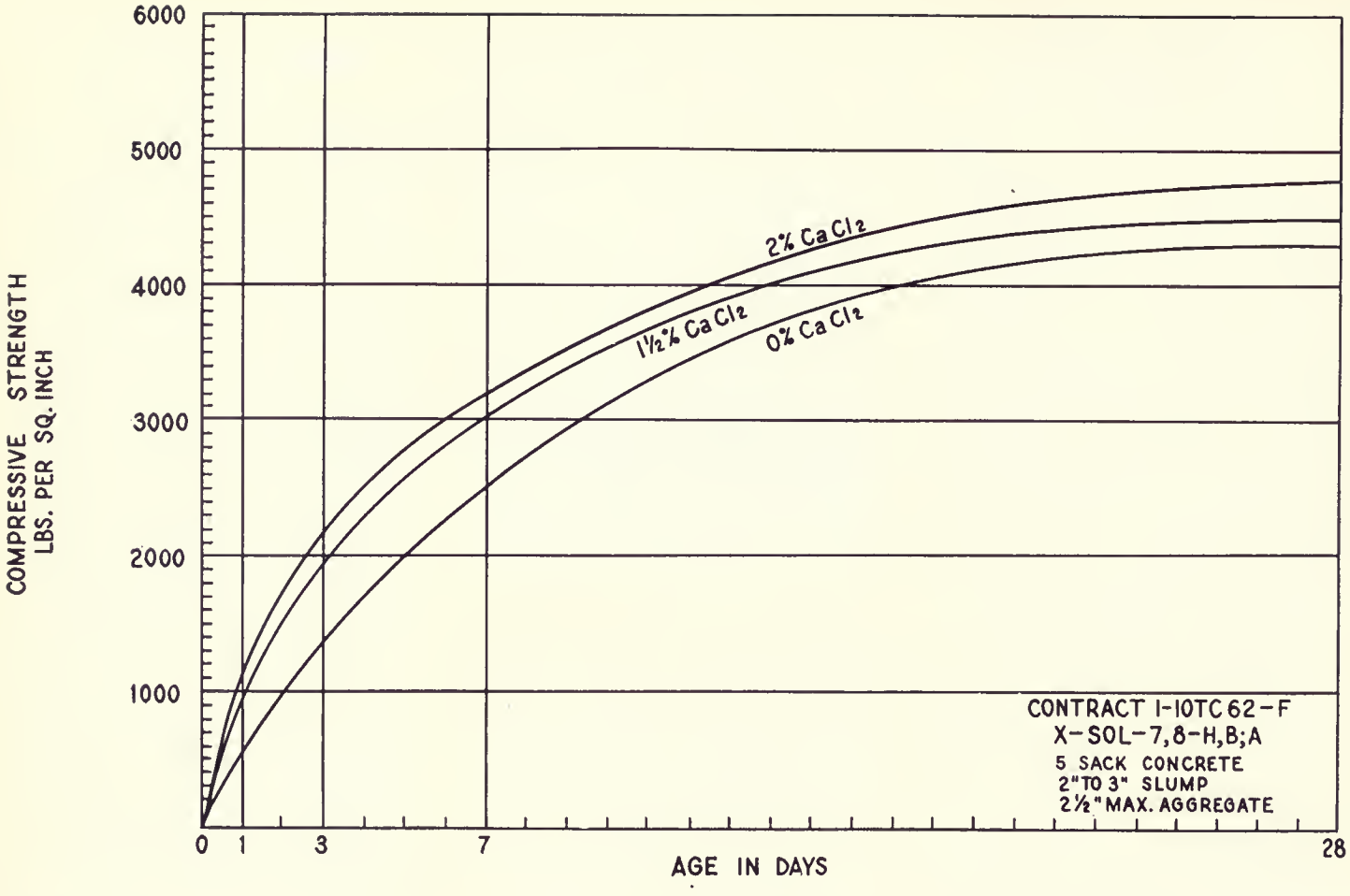
From 1919 to 1928 he practiced his profession in Virginia and New England states. Returning to California, he engaged in storm and sanitary sewer design and construction for the Cities of Richmond and Woodland. From 1931 to 1934 he was in private practice. From 1934 to 1938 he held various administrative positions with CWA, SERA and WPA.

John Miller is, and always will be, a tradition at Stanford. His phenomenal performances on the track and on football fields are still recalled whenever and wherever college grads gather. He excelled in the 440-yard dash, the half-mile and in relay races. In track events and in football he was called the "Bakersfield Jackrabbit."

Mr. Miller was born in Bakersfield on August 19, 1886. He was educated in the public schools of that city and went on to Stanford to win honors in collegiate sports that made him internationally known.

He was a member of various Masonic orders including Ben Ali Temple Mystic Shrine. He was Past Commander of Yolo Post No. 77, American Legion.

Mr. Miller is survived by his widow, Alene, Sacramento; two brothers, Harry, of Las Vegas, Nev., and Tom, of Glendale, and a sister, Mary Ashe Miller of Las Vegas.



Concrete Paving

Continued from page 21 . . .

finishing operation and in the quantity of calcium chloride used:

1. Finishing of concrete pavement as specified in the California method is designed to prolong the final finish by intermittent surface manipulation until the maximum subsidence has taken place. This method results in improved riding qualities and in a nonskid surface texture. On very warm days the addition of a full 2 percent of calcium chloride may not result in the maximum subsidence desired. On such days smaller quantities are advisable; however, the higher curing temperature will result in higher early strengths and offset the loss occasioned by the use of lower percentages of the accelerator.

2. The treated concrete hardens rapidly after the final passes of the drag finisher and the effective period available for the steel cut float used in the final finish is reduced.

3. Calcium chloride should not be added to any section shorter than the average effective run of the self-propelled drag finisher (175 to 250 feet). The finishing characteristics of the treated and untreated pavement within one pass of the finisher may be such as to make this operation difficult and unsatisfactory.

Results Obtained

The principal increase in compressive strength of the treated over the untreated concrete results in the first seven days. After this period there is little significant benefit in the treated concrete. At the end of one and three days, 2 percent of calcium chloride will almost double the compressive strength of normal concrete. At seven days, treated concrete was 30 percent higher, but at 28 days there was little difference in the compressive strengths.

While larger proportions of the admixture will increase the early strengths of the concrete, the addition of not over 2 percent is advisable. Higher percentages may have deleterious effects on the quality of the concrete as well as complicate the normal finishing operation.*

Benefits possible from the addition of calcium chloride to pavement concrete:

(1) Expedite the opening of the pavement to traffic or to the contractor's equipment.
(2) Decrease the number of pavement crossing devices necessary.
(3) Slight decrease in setting time will be helpful in winter paving.
(4) Decrease protection time necessary in maintenance patches, etc.

The test section was placed with the cooperation of Parish Bros., Contractor, Ed Craun and Kenneth Hatch, Resident Engineers, and Lou Kovanda, Associate Materials and Research Engineer.

* Recent studies indicate that the addition of calcium chloride may increase the expansion caused by the alkali-aggregate reaction.

A good driver obeys the traffic rules and is quick enough to dodge those who don't.

Some Gadget

Bridge Department Uses One of Largest All-welded Steel Beams

By RALPH H. KIPP, Assistant Steel Inspector, Materials and Research Department

One of the largest all-welded steel beams ever manufactured on the Pacific Coast was recently placed in position on the State Highway System. The beam, 53 inches deep and 106 feet long, is part of the Route 69-228 Separation Structure on the Eastshore Freeway, State Sign Route 17. This structure is located about one-fourth mile northwest of San Lorenzo near Oakland at the junction of State Highway 228 with the Eastshore Freeway.

The location and controlling features at this grade separation structure sound like a bridge designer's nightmare. There is a combination of limited headroom, high skew, and the structure is on a curve. The location at the same time represents a culmination of a highway designer's dream, in that it produces roadway interchange to give traffic greater safety and freedom of movement.

Problem Met

The Bridge Department of the Division of Highways, which has the responsibility for structural design, found the most economical solution to the problem to be the use of solid wall reinforced concrete abutments built along the curve and skew of Route 228. Then to support the Eastshore Freeway roadway slab steel stringers were placed perpendicular to the abutments. This necessitated facia beams to support one end of the stringers along each side of the upper roadway. Because of the combination skew and curve these two beams are of different lengths. The span of the south edge member is 100 feet, whereas, that of the north edge is but 65 feet. The south edge beam is not only heavier than the north, but also takes advantage of composite action with the concrete curb by the use of shear lugs along its top flange. It is the construction of the longer of these two all-welded members of the steel structure that is described in the following article and shown in *Photo 1.*

Ambitious Product

When this ambitious structural product of the highway and bridge designer arrived in the fabricating yard of Judson-Pacific-Murphy Corporation it then became an interesting inspection problem for the Materials and Research Department. The production of these beams as weldments was necessary because the largest standard rolled beam is 36 inches deep (which is considerably short of the designed 53 inches depth) and does not have the strength required. Structural steel plates were used as a fabricating material.

A cross section through the beam is shown in *Figure I.* The top and bottom flanges are 3 inches thick. The web was manufactured from $\frac{7}{8}$-inch x 48-inch plate. The flanges were made in three segments each. The top flange segments were 23, 37 and 46 feet long and the bottom flange segments were 26, 37 and 45 feet long. Each flange required two butt welds, as shown in *Figure II.* The ends of the flange plates to be welded were prepared by gas burning or cutting to 30 degree angles and then grinding the flame-cut surfaces. The welds were made with a semiautomatic welding machine using $\frac{5}{64}$-inch wire, 420 amperes and 30 volts.



PHOTO 1

Welding Process

An average of 14 passes were required to weld each side. After completing the welding of one side, the plates were turned over so as to complete the construction. The second side

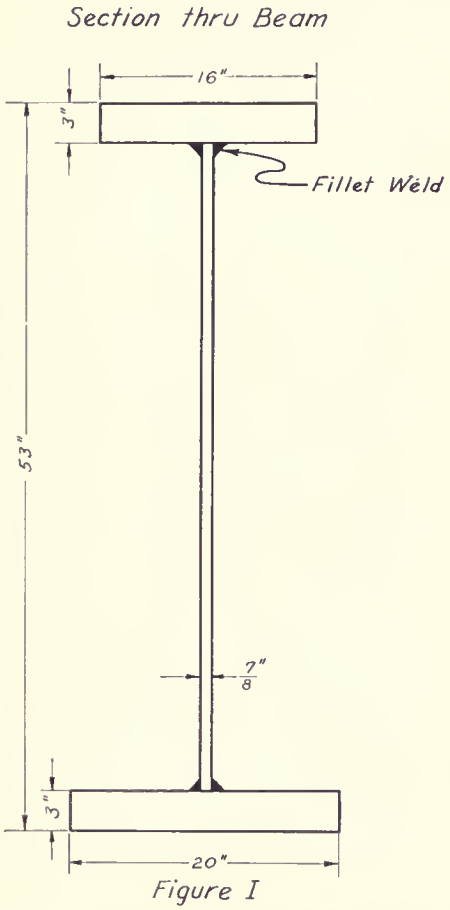
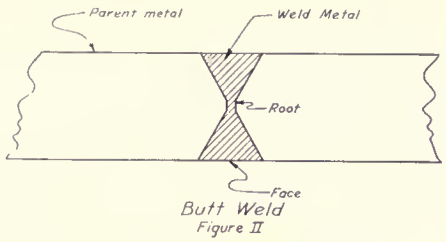


Figure I

was chipped down to clean metal before placing the weld. In order to have full welds on the three-inch face, small structural steel angles were tack welded to the edges of the flange plates. This formed a table on which the welding machine could operate so as to start and end the weld outside the edge of the flange. These extensions were later burned off and ground smooth resulting in a full-width sound weld. The butt welding of each flange took approximately two and one-half hours for each side. The plates were preheated to a minimum metal temperature of 300 degrees F. and the metal kept up to temperature by two gas torches and one large kerosene torch.



Butt Weld
Figure II

One of Major Problems

The web plate was fabricated from two sections 37 and 70 feet in length, respectively. These plates were beveled to 30 degrees and welded with a Unionmelt automatic welding machine. Oxyweld Number 36, 3/16-inch wire was used in the automatic machine working at 800 amperes and 30 volts. Before starting this weld, a small "sealer" pass was welded in by hand.

As steel plates are invariably warped or distorted by heating local areas, straightening of the plates both before and after welding was one of the major problems throughout this complete fabrication. This was especially true of the three-inch flange plates. Straightening had to be accomplished before and after each complete weld and then the completed web sections and flange section were straightened again before final assembly. Straightening was accomplished by the application of heat and pressure.

Final assembly of the plates into a structural beam was undertaken on a skid especially constructed for the job. *(Figure III.)*

Supporting Framework

The "skid" or supporting framework consisted of 36-inch beams placed flat and end to end for the entire length. On the top sides of the 36-inch beams, 12-inch wide flange heavy section beams were placed transversely and evenly spaced along the entire length. This assembly was leveled and straightened and then welded together. Uprights were then bolted to the 12-inch transverse members. The uprights were bolted solidly in place along one side, while those on the opposite side were movable. Space was left between the uprights for the 53-inch beam. Hydraulic jacks were placed as shown in *Figure III* so as to apply pressure through the slotted uprights. The entire assembly acted as a huge vise to apply pressure to the complete beam in order to bring the webs in contact with the edges of the flange plates.

Before final fitting-up was started, the web plate was trimmed to a width of 47 inches and the areas where it would contact each flange were cleaned by grinding. Fitting was started at the center of the beam and simultaneously worked toward each end. One movable vise was needed on top in order to correct lateral variations in the beam.

Eight-ton Jacks

It was first thought that five-ton jacks would be adequate for this process. However, it was found necessary to use eight-ton equipment so as to bring the three-inch flanges into the desired contact. Preliminary assembly was fixed by tack welding the web to the flanges. Tack welds slightly longer than those used under normal fabricating conditions were applied. This was done so as to hold the members squarely in contact and also to provide a better base for the automatic welding

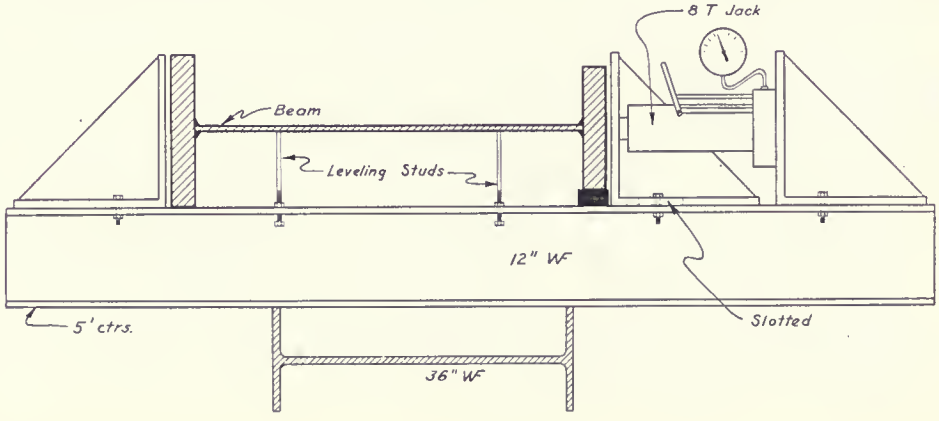


Figure III



PHOTO 2

machine during the fillet welding operation. Before starting the fillet welding, the surfaces were cleaned with power-driven brushes and all interfering tack welds were chipped out and replaced. It was necessary that this cleaning operation be done very carefully in order to secure proper penetration and to limit surface defects.

Fillet Welding

The fillet welding also was performed on metal preheated to 300 degrees minimum. This heat was maintained ahead of the welding machine by a large kerosene torch and four gas torches. The temperature was controlled by using 300-degree "Tempilstiks." Temperature control was also checked by using an Alnor portable pyrometer. A Tempilstik is a temperature indicator manufactured from material which will melt at the desired temperature. The fillet welding was done by the Unionmelt process using one-fourth inch Number 36 Oxyweld wire with an amperage of 1,015 to 1,100 and a voltage of 27 to 30. Four hours were required for the welding machine to travel the 106 feet in making one fillet weld. This consumed about 75 pounds of welding wire for each 106 feet of one-half inch fillet.

Beams at 35-degree Angle

In order to secure equal penetration of the web and flange during the welding operation and still have the welding machine in a controllable position, the beams were placed at an angle of 35 degrees with the horizontal. The welds were started and finished outside the beam by the use of an end platform. The beams were supported on skids during the complete welding operation. A camber of about two and one-half inches was produced in the 106-foot beam during each heating and welding sequence. The cooling after each welding operation was inhibited by augmenting the insulating qualities of the slag by six-inch strips of asbestos board. Cooling required from eight to ten hours and the various temperature readings were as follows:

At 1 hour after welding—
flange 210 degrees, web 180 degrees
At 2½ hours after welding—
flange 148 degrees, web 128 degrees
At 4 hours after welding—
flange 128 degrees, web 98 degrees

Temperature readings were taken of the steel six inches from the weld. The average lengthwise expansion following each weld operation amounted to about one-eighth inch in the over-all length of the beam. Following the completion of all welding and cooling, the beam came within all tolerances required of a roll section. It also returned to its original straightness losing the camber resulting from the heat.

Radium Used for Photos

Inspection of the welding was performed by the writer who was present during all welding operations. This visual inspection was supplemented by nondestructive testing. Complete gamma ray pictures were taken of the butt welds and of a reasonable portion of the fillet welds. The gamma ray inspection pictures were taken of each butt weld by raising the flange three feet from the floor. The gamma ray pellet was then placed between the floor and the plate, about 24 inches from the weld. The gamma rays were generated by a 100-gram capsule of radium. The negatives were placed over the weld and for this three-inch material were exposed about eight hours. The exposures for the fillet welds were made by placing the negative on the outside face of the flange with the beam in an upright position. The capsule was then placed at an angle of 20 degrees from the web and about 24 inches from the weld. *Photo 2* shows a picture through a butt weld and *Photo 3* shows a fillet weld.

The "X-ray" (gamma ray) pictures taken during the inspection period were made by the Pittsburg Testing Laboratory. It may be of interest to note that the radium capsule used by them is valued at approximately $50,000.

The beam was manufactured for the contractor, Fredrickson and Watson Construction Company, by Judson-Pacific-Murphy Corporation of Oakland, California. Fabrication inspection was performed by the writer. The Resident Engineer is J. N. Perry of the Bridge Department.



PHOTO 3

Antiskid

New Method of Roughening Slick Seal Coated Pavement Surfaces

By N. R. BANGERT, Assistant Maintenance Engineer, Division of Highways

During the past two years, several of the northern districts of the Division of Highways have had under development a new method of roughening slick seal coated pavement surfaces. This treatment consists of softening the binder by means of heat and grooving the seal coat course with a rake-type drag.

Experiments along this line were first carried out late in the fall of 1950 by the maintenance personnel of District II. To date, the operation has been confined to—and appears to be particularly adapted to—the treatment of newly laid seal coats where a slick condition has resulted from the flushing of the binder to the surface of the screenings course. In such cases, the submerged screenings are literally turned over and road-mixed by the passage of the drag tines. As the amount of heat applied is only sufficient to soften the binder of the seal coat, the underlying mix is not disturbed or injured by the operation; also, as the binder chills rapidly behind the drag, only a small amount of the seal coat aggregate is whipped off by traffic.

Effective Seal

The effectiveness of the seal as a means of preventing the penetration of moisture into the underlying surface course is less impaired by this treatment than by the scoring and gouging resulting from the use of disc scarifiers.

The pavement is heated by means of the flame generating equipment assigned to some districts for the purpose of killing roadside weeds during the spring months. These burners are trailer-mounted and develop intense heat by burning a light fuel oil in a draft created by a blower powered by a small air-cooled engine. The flame is

. . . Continued on page 63



UPPER—Heating and raking equipment used on U. S. 40 in District III. CENTER—Top of burner and spike drag used in District II. LOWER—Portion of U. S. 40 treated by heating and raking.

Conference

Engineers Discuss Street and Highway Problems on Broad Level

Subjects as general as the national long-range highway outlook and as specific as road surfacing methods were analyzed and discussed at the Fourth Annual Street and Highway Conference, held on the campus of the University of California at Los Angeles February 6th-8th.

More than 400 engineers and officials representing federal, state, city and county governments participated in the conference, along with representatives of the materials and transportation industries.

The conference was conducted by the Institute of Transportation and Traffic Engineering of the University of California, of which Harmer E. Davis is director. Deputy State Highway Engineer R. M. Gillis is a member of the institute's advisory committee. Representatives of the Division of Highways serving on the program committee for the conference were F. N. Hveem, Materials and Research Engineer, and H. B. LaForge, Engineer of Federal Secondary Roads.

Many Subjects Covered

Among the subjects covered in the three days of general and group sessions were: planning, construction, maintenance, administration, personnel, financing, public relations, and research in numerous fields ranging from road test sections to safety belts in motor vehicles.

Following the opening of the conference in Royce Hall by Chairman Joseph E. Havenner, manager of the public safety department of the Automobile Club of Southern California, and a welcome by Dean Paul A. Dodd of U.C.L.A., the initial general session took up the broader aspects of highway development trends. The statewide deficiency problem was sketched by State Senator Randolph Collier, and the needs of Los Angeles County by Chairman Roger W. Jessup of that county's board of supervisors.



Roy Jorgensen, Engineering Counsel, National Highway Users Conference, left, and Joseph E. Havenner, Automobile Club of Southern California, Chairmon of Conference

One potential answer to the problem on a nation-wide scale was then outlined by Roy Jorgensen, engineering counsel of the National Highway Users Conference, who reported that a co-ordinated attack on highway deficiencies was being prepared by the principal commercial and industrial groups with a stake in adequate roads, under the banner of PAR—Project, Adequate Roads.

After a report on the strategic materials situation by Assistant State Highway Engineer Richard H. Wilson, the conferees adjourned to section meetings of their choice.

Maryland Road Test

One group first received a verbal and pictorial report on the Maryland road test section and a preview of the forthcoming Idaho road test sponsored by the Western Association of State Highway Officials; and then took part in a discussion of road mix methods led by Raymond Harsch of the Shell Oil Company.

Another group heard a broad-gauge review of the urban transportation situation by Director Davis of the I.T.T.E. and Dean L. M. K. Boelter of the U.C.L.A. College of Engineering. This was followed by a review of

truck traffic problems led by Wade Sherrard, manager of the Motor Truck Association of California, and Dan M. Finch, testing director for the California Highway Patrol.

At the general session on the second day the conferees were given an educator's view of the engineering personnel problem by Dean George W. Gleeson of the School of Engineering of Oregon State College. The next speaker was A. Allan Bates of Chicago, vice president of the Portland Cement Association. He described the Illinois tests which produced the unexpected discovery that a small amount of air whipped up into concrete mixtures apparently retarded deterioration.

Group Sessions

After a tour of the campus engineering facilities, the conferees met again in group sessions.

One series of group meetings took up skid resistance studies specifications for light-traffic roads and streets, and priority ratings for improvement projects. The discussion leaders included: R. A. Moyer of the I.T.T.E., Assistant State Highway Engineer Earl Withycombe, Road Commissioner E. H. Hanna of San Benito County, Supervisor C. F. Peterson of Humboldt County, and Norman Kennedy of the I.T.T.E.

Another group first considered employee morale, as discussed by City Administrator F. R. Coop of Inglewood; and then heard a talk on "Preventive Maintenance, a Must Today" by Harold F. Hess, executive vice president of the Construction Industry Manufacturers Association, Chicago.

Traffic Trouble Spots

The third series began with a session on "Fixing Traffic Trouble Spots," led by Assistant Traffic Engineer R. J. Israel of the Division of Highways and Arthur Philpott, traffic analyst for the City of San Jose. Then J. R. Paulson, editor of the Palo Alto Times, spoke on "Getting Support for Traffic Improvements."

The remaining group session was devoted to summaries of typical I.T.T.E. research projects. These projects were described by the graduate students who conducted them. They covered such fields as: safety belts for front-seat automobile passengers; comparative delays at four-way stop versus semitraffic-actuated signal control intersections; and sampling techniques in estimating traffic volume.

The final general session opened with a summary by W. R. MacDougall, general manager of the County Supervisors Association, of "Changing Legislative Concepts of California County Road Administration." This was followed by California Highway Commissioner Harrison R. Baker's talk on "Coordinating State-wide with Local Interests in Highway Problems" (summarized in this issue of *California Highways and Public Works*). Edwin S. Moore of the California State Automobile Association spoke on "Public Relations."

Lively Panel

A lively panel discussion on "Responsibility for Traffic Safety" was conducted by Professor Amos E. Neyhart of Pennsylvania State College. Many questions from the audience were answered by the following panel members, each of whom represented a specialized point of view: Earl Campbell, Director of Field Organization for the National Safety Council; J. Allan Davis, General Counsel of the Automobile Club of Southern California; J. C. Young, Traffic Engineer, Division of Highways; Russell Emmett, inspector for the California Highway Patrol; and Wade Sherrard, general manager of the Motor Truck Association of California.

At the luncheon meeting which concluded the conference the principal speaker was Pyke Johnson, President of the Automotive Safety Foundation. His subject was "Zero Hour for Highway Safety."

Pyke Johnson, President of Automotive Safety Foundation, left, and Dean L. M. K. Boelter, College of Engineering, U. C. L. A.



CONFERENCE HIGHLIGHTS

SOME OF THE points emphasized by speakers at the Fourth Annual Street and Highway Conference held at the University of California at Los Angeles in February:

State Senator Randolph Collier: "The Division of Highways' deficiency report is only an inventory. It is not the blueprint of a program. Many people seem to think that the deficiency report calls upon us to write out a blank check for three billion dollars. They seem to forget that highway problems are dynamic and that the Legislature meets every year and can modify them. * * * I've asked many people who have examined the deficiency report if they could tell us of any project that ought to be taken out of the inventory. We haven't received a single suggestion to take out a project; on the contrary, we have been told that the report fails to include some urgently needed improvements."

Pyke Johnson, President, Automotive Safety Foundation: "The Nation is paying far more in blood and dollars year after year than it would cost to provide the requisite capacity and safety. The National Safety Council estimates that accidents cost us about 3½ billion dollars annually —more than the amount spent on road and street construction. In addition, deficient roads cost us at least as much again in higher insurance rates and transportation charges."

Roy E. Jorgensen, Engineering Counsel, National Highway Users Conference: "At what city can you point and say, there the job is done? Even in the rural areas where the problem is much simpler, the main routes between the major cities are largely obsolete. Fortunately, the limited mileage of completed modern facilities set a pattern. We know the great benefits that will be derived from congestion relief and reduced hazard. What we need now is full recognition of the magnitude of the job to be done and coordination of all efforts toward its accomplishment. A new good roads movement, geared to the problem of the fifties, can provide the impetus now just as did its predecessor in the twenties. So we have the need for PAR—Project: Adequate Roads."

Dean George W. Gleeson, Oregon State College: "Easier courses or lower aptitude requirements will not produce the high-grade engineering talent which is now more necessary than ever. If more engineering freshmen are to be obtained, they should rather be obtained through proper high school guidance. High school students should be encouraged to take more mathematics courses rather than be discouraged from taking them, as is now a far too prevalent practice."



R. A. Moyer, Research Engineer, I. T. T. E., University of California, left, Earl Withycombe, Assistant State Highway Engineer, California Division of Highways

William R. MacDougall, General Manager, County Supervisors Association of California: "It is true that under the Collier-Burns Act and its 1951 amendments the individual, personal, detailed duties of each supervisor as an operating road superintendent in his district are gone. In contrast, the power and authority of the five-man board is emphasized and reaffirmed. The Legislature has given us, and we are now operating, a county road system under complete local control, but yet with proper engineering and administrative techniques guaranteed as a basic part of each county's system. The State is sharing its centrally collected highway users revenues with the counties. Where necessary, special local taxes are being levied to supplement these funds. Policy control remains what it should be—a challenging local responsibility."

J. R. Paulson, Editor, Palo Alto Times: "Every investigation concerning improvements or changes should be complete, then presented honestly to the people. Projects should be submitted to the people in public meetings, through the newspapers, and on radio and television. The whole story should be told, not just part of it. If this is done, 99 percent of your worthy projects will go through smoothly and easily."

Supervisor Roger W. Jessup: "During the postwar years, hundreds of miles of Los Angeles County highways have become strangled by the mushroom growth of subdivisions, shopping centers and industrial areas. What was yesterday a through, modern highway is today a bottleneck of traffic congestion. Yet, at the same time, the demand for more new highway facilities has increased out of all proportion to our ability to provide them."

Coordinating State-wide and Local Highway Problems

By HARRISON R. BAKER, Member, California Highway Commission

One of the problems frequently dealt with by the California Highway Commission is the problem of relations with individual communities where state-wide and local interests *appear*—I italicize "appear"—to be in conflict. To be perfectly frank, it is one of the toughest public relations problems which confronts not only the Highway Commission, but any governmental board or agency which must base its decisions and actions on the general welfare.

This problem may arise on a gigantic scale—as, for example, when a Federal Government atomic energy project displaces half a county in South Carolina. It may arise on a very small scale—as, for example, when a city lot is to be rezoned. The local-interest problems of the California Highway Commission are sometimes large, sometimes small—but I assure you they are certainly frequent.



HARRISON R. BAKER

Not Unnatural Situation

There is nothing unnatural about this situation. Whenever any individual, or group of individuals, believes that he or they are called on to sacrifice something, you have a problem. If it's an individual, you might call it a sales problem. If it's a community, one usually terms it a public-relations problem. It boils down to this: if, through open discussion, you can show the individual or the community that the proposed sacrifice is

(1) not so serious as it looks, in fact, maybe not a sacrifice at all;

(2) something that will serve a worthy purpose; and

(3) one which contains sound, objective, logical reasons why that one person, neighborhood, or community should have been singled out—then you have the problem pretty well solved.

If, in addition, you can start to present your case early enough—before misunderstandings arise—you will be able to keep the discussion on an unemotional, friendly basis; and the individual, neighborhood, or community will be taking an objective view as well as yourself.

Case of John Doe

Let's consider John Doe, citizen and businessman of Anytown, California. How does he regard highway problems?

The answer is that John Doe is more than one person. He regards highway problems in the light of what use he is making of what particular road for what particular purpose and at what particular time.

When John Doe is earning his living at his place of business, he thinks of highways in terms of their effect, or apparent effect, on his personal income. If he thinks he benefits directly or indirectly from the through traffic which proceeds along the streets of Anytown, he will instinctively resist any suggestion which may interfere with the existing pattern.

This John Doe becomes alarmed at the first rumor of a highway survey crew or right-of-way inquiry. He gets his chamber of commerce secretary on the phone, contacts his city councilmen and county supervisors, writes his legislators, and urges the local newspaper editor to verbalize his protest against any proposal to upset Anytown's good old status quo.

The Point of View

Of course, when John Doe has to go out of town on a business trip, or when he packs his family into the car to see faraway scenes and places, he becomes quite a different John Doe. He studies his road maps to see how best to bypass cities on his route. He chafes audibly at every stop-light; his blood pressure goes up every time he has to fall in behind a truck on a narrow road curving up a steep hillside. He particularly resents slowing down for business developments which have mushroomed along the highway and considers a 35-mile speed zone as a personal affront.

When he gets back home, weary from battling congested traffic, John Doe writes to his legislator, to his newspaper editor, and very likely to the Governor about the plague of bottlenecks on our highways, which shorten a man's vacation or rob him of valuable business time. Why, he says, do you have to fight local traffic and stop-lights every time you hit the smallest village? Why on earth don't we build highways so that they'll do their primary job of carrying through traffic expeditiously and safely? And, keen business man that he is, John Doe points out in his letter that in addition to all the other benefits we would enjoy if every town were by-passed and there were no dangerous intersections, it's obviously cheaper to build highways in a straight line out in the open country than to route them through busy towns.

Different at Home

Then, back in his Anytown routine, John goes off to attend a committee

meeting to map the strategy for a campaign to keep traffic routed close to the business district as it passes through town, regardless of traffic convenience, even if it does cost a few hundred thousand dollars more for construction and rights of way than the route proposed by the engineers.

Thus, our public-relations problem involving local communities is to merge these two John Does into one person. John isn't realy the unreasonable fellow I have just pictured. He is capable of listening to and comprehending an explanation of state-wide highway problems, and of changing his point of view when all the facts are presented. Also, he often is able to contribute additional information on community traffic needs and pending local industrial or other expansion. Given the data pertinent to the problem, John Doe is capable of becoming the foremost ally of the highway planner.

Benefits From By-Passing

The most striking example of John Doe's receptivity to facts is in the economic effects of by-passing business districts. A few years ago communities were keeping their big guns loaded for the first indication that through traffic was going to be routed around their downtown areas. Merchants envisioned deserted main streets and imminent bankruptcy if and when the stream of vehicles was diverted from their front doors. We all know that in general the reverse is true. We are acquainted with the several studies of typical communities. Through these studies merchants as well as the general public in North Sacramento, in Escondido, in Temecula, and in Auburn have been made aware that economic gains, not losses, have resulted from the freeways by-passing their business districts.

It should be acknowledged that to some extent, at least, we of the Highway Commission, and the highway engineers, must shoulder the blame for some of the misunderstandings. In past years the policy was to divulge as little as possible of our plans for highway location, partly to prevent complications in the acquisition of rights of way, and partly to prevent hardship and uncertainty which often occur during the interval between route determination and actual construction. This latter condition pertains to some degree regardless of public announcement of highway intentions.

New Freeway Policy

Thus, formerly, the first word a community received of a proposed highway improvement often was the announcement of formal adoption of a route by the Highway Commission, with no indication whatever that local needs and problems had even been taken into consideration. They had been, of course, but the townspeople could not be blamed for not realizing it. And quite possibly we did not have the full benefit of information concerning pending local expansion or developments.

An important step in highway public relations was taken on July 15, 1948, when the commission adopted a resolution setting forth its present policy with respect to determination of freeway routes.

(*Editor's note:* At this point Mr. Baker went into details of the resolution, which provides for adequate public notice to the citizens of any locality where freeway construction is under consideration, and for the offer of a public hearing by the commission in advance of adoption of a freeway route.)

Copies of this resolution, which might be termed the Communities' Highway Bill of Rights, were sent to the city councils of the more than 300 incorporated cities and all 58 county boards of supervisors in California. It put them on notice that henceforth the location or relocation of freeways would be treated as public business from its inception, and that whatever final decision was made would be based on "open covenants openly arrived at."

Full Information

This full-discussion policy has since been implemented to the hilt by the State Highway Engineer and his staff. Not only have meetings been held by the district engineers with local officials; they have also been held with business groups, neighborhood clubs, and any other interested segment of the community. Maps have been made available for posting and for publication, at various stages of planning, up to and including the final declaration of intention by the Highway Commission to adopt the route. Letters have been sent to local governmental bodies advising them of the various steps being taken. The district engineer and members of his staff, and sometimes members of the Highway Commission, have spoken before service clubs and have made particular effort to furnish full information to the press.

As a result, the people of the various communities concerned have "sat in" on the important discussions leading up to the determination of the highway route, and know that they have "sat in." Even those who are still not satisfied with the final choice—and there is no community without its dissenters—are aware that they have had their say, and that their views have been given full and courteous consideration.

The development of public understanding of the state highway program involves, of course, a good deal more than full notice and discussion of proposed route adoptions. It requires a constant attention to the public-relations possibilities in every contact, in every piece of correspondence, and, at many other stages, in the process of planning, financing, building, and maintaining highways.

Most of the regular meetings of the commission are held in Sacramento. Every effort is made, however, to hold meetings in other parts of the State when feasible. Such a practice permits more groups and individuals to appear and be heard before the commission without the expenditure of too much of their own time and money in travel. During the latter half of 1951, the commission held one meeting in San Francisco and one in Los Angeles, and the meeting in January, 1952, took place in San Diego.

Heorings Welcomed

Wherever the meeting is held, individual and group appearances are solicited. When possible, appearances should be arranged in advance. This gives the commission secretary an opportunity to schedule the group for a definite hour, geared as closely as possible to the distance it must travel to the meeting site and to the amount of time required for the presentation.

More often than most people realize, the commission goes to the public. Not

all at once, of course; but individual members make as many appearances as possible before local groups. To an even greater extent, members of the Division of Highways staff have made themselves available for talks, showing of slides, and other public presentations of highway matters.

Highways are always news. Therefore, a steady stream of news releases has been maintained for years by the commission and the Department of Public Works. These releases cover both routine and special activities incident to the highway program, keeping the public informed not only on commission actions but also on calls for bids, award of contracts, completion dates of projects, and so forth.

In addition, there has been a healthy and growing trend toward issuance of more information to news media from the various district offices of the Division of Highways. Our engineers are encouraged to cooperate with newspapers as fully as possible, with emphasis on prompt and full response to questions by reporters.

Good Relations Essential

You are familiar, I know, with the bimonthly magazine, *California Highways and Public Works*. This publication serves several purposes. It not only provides information to those in California who are interested in highway development; it also serves as a medium of technical information for the far-flung staff of the Division of Highways and as a means of interchange of highway ideas among engineers and governmental agencies throughout California, the United States, and many foreign countries. Newspapers and other general publications make frequent use of the articles and illustrations contained in the magazine.

We have reason to believe that progress is being made in establishing and maintaining good relations between the state agency and the local community with respect to state highways. The consideration given to local problems in selecting routes is becoming generally known, and there have been a number of well-publicized instances of changes made at the instigation of community interests. Sometimes these changes have even been made against the better judgment of the commission and the engineers.

Santa Maria Example

One of the finest examples of state-community relations at their best is the advance thinking, planning, and public discussion with regard to the proposed freeway which will by-pass Santa Maria. Although funds for construction of this project are not yet available, and the people there have been repeatedly so informed, there has been ample foundation laid for the eventual choice of route. The District Engineer has explained in general terms the various alternative routes which may be considered. He also has outlined the factors which weigh more or less heavily in the final determination of routes by the commission, including the factor of local desires. The local newspaper carried full advance and follow-up accounts of a recent public forum on the subject; a few days before the forum it printed an editorial outlining the basic facts, for use by those planning to participate in the session. Thus, when all the engineering data are finally available to the commission, the choice of a route carrying traffic through or around Santa Maria will be made with all the cards and opinions on the table; and if further discussion is needed, it can be held in an atmosphere cleared in advance by mutual understanding of the essential elements involved.

Buellton Story

You probably know of examples of completed freeways which follow routes different from those recommended by our engineers on the basis of traffic service and economics. The Buellton story is one of the earliest and best-publicized of these; it was a case of enlightened civic leadership which met the engineers half-way and enabled us to work out a compromise which served both the economy of the town and the needs of through traffic, with some sacrifice on both sides. A still more recent story is that of Placerville. The route best serving traffic and the only route economically feasible through town involved displacement of some important buildings. Our engineers and particularly our right-of-way agents worked everything out, aided in large measure by the initiative and cooperation of the community; construction of the first unit of the Placerville Freeway is scheduled to start this year.

San Rafael Story

At a public meeting in San Francisco about a year ago, the city managers of three cities located north of the Golden Gate Bridge on Highway 101 were called on to discuss freeways and expressways.

First, San Rafael. The 2-mile freeway through San Rafael by-passes the business district by means of an overhead structure which crosses the four major streets of the city. When the plan for the overhead was broached, many merchants objected strenuously. But the proponents, headed by the city council, urged that the overhead recommended by the engineers be constructed, and it was. This is what the city manager had to say a year ago: "We in San Rafael are definitely of a single mind that the construction of the state highway through our community was the most desirable single project that we have ever had accomplished in recent years for the safety and welfare of our citizens as well as the motoring public."

Petaluma Story

Second, Petaluma. After thorough local discussion a freeway routing which would by-pass the city and yet be satisfactory to the people of the area was agreed upon. The existing routing of the Redwood Highway through the heart of the business district has led to noise, congestion, accidents, and other undesirable results. The city manager summarized 10 beneficial effects of the proposed by-pass, including: increased local business activity, increased property values, increased safety and convenience for both pedestrians and local motor traffic, reduced noise and hazard from through traffic (particularly trucks), and better parking facilities and control of local traffic.

Santa Rosa Story

Now, Santa Rosa, and the other side of the picture. The recommendation of the State Highway Engineer was for a route somewhat to the west of the City, at a cost of less than $1,000,000. But local interests became aroused. When the smoke had cleared, the commission had acceded to local insistence and adopted a route close to the business district and only a little to the west. A compromise proposal of the state engineers for a five-block viaduct over some of the main intersecting streets likewise had been rejected by organized local groups.

Many of you know the rest of the story. The so-called freeway at ground level through Santa Rosa has been the scene of congestion, increased accidents, and finally a 35-mile speed limit through the city. Says the city manager:

"The present construction after two years, if we are willing to face the facts, can no longer be considered a freeway; it is only a widened highway running through a heavily traveled 3-mile stretch with dangerous cross traffic.

Speaking as a member of the commission, I might add that the situation which occurred in Santa Rosa is not likely to occur again, for a number of reasons. One reason, of course, is that we know a good deal more about freeways and their local effects than we did a few years ago. Another reason is that the local communities themselves are more aware of the benefits of efficiently planned by-passes, as just illustrated by the experience of San Rafael and the attitude of Petaluma.

Many New Freeways

Since the new procedure on route adoptions was laid down by the commission three and a half years ago, we have adopted nearly 600 miles of freeway. In 41 instances, the new routing involved areas in which there had been some appreciable degree of development. As stated in the procedural resolution, the commission offered in each of the 41 cases to hold hearings. The number of hearings actually requested and held was eight. Five of these eight hearings were held during the first year under the new procedure. One of the cases was actually a pleasant misunderstanding. The city council of a northern California city informed us that they wanted a hearing held. A majority of the commission turned up as scheduled, sat down with the local leaders, and then discovered that the community had no objection whatever to the proposed route. It seems that they had felt that to decline the offer of a hearing would be discourteous to the commission.

This is not to say that all is sweetness and light in the matter of route adoptions. There are still differences of opinion, sometimes vehemently expressed. But I should like to point out again that the discussion of facts and viewpoints, even in the knottier problem cases, is a matter of public knowledge and public participation, and I am more confident of happy solutions in all cases because the basis for the solution will have been threshed out in full public view.

Room for Improvement

It is obvious that room exists for still more improvement in our relations with communities. Misconceptions are still far too widespread to permit us to relax our efforts to interest and inform John Doe on the subject of highways.

In the face of all I have just related, we still hear remarks like: "They'll put the highway where they want to, regardless of what we say." People who make such misstatements constitute a definite public-relations challenge.

Then we hear people in some parts of the state saying: "The big cities get all the money for fancy freeways while they leave us cow counties in the mud." And in other parts of the State we hear this: "Why don't they relieve our traffic congestion instead of building roads in cow counties for one-tenth as many cars?" Here is a public-relations problem of the greatest magnitude: How shall we explain to both groups of people that under law and under commission policy the needs of both are being met as equitably as possible, and as rapidly as the present system of financing will permit?

Many Misconceptions

There are many more misconceptions, some within the province of the engineer rather than the Highway Commission, but all of them demanding correction as part of an over-all program to make John Doe better informed on highway matters. "Those new lanes are all paved; why can't we use them right now?" I know you are familiar with that one. How do you get across to the motorist bottled up on a congested two-lane stretch of highway parallel to a nearly completed additional two lanes, the facts about necessary completion of shoulders, concrete pavement curing, seal-coating, installation of signs and lights, and so forth? How are you going to cope with the incessant demand for traffic signals at every intersection of a state highway with a city street, and explain the distinction between traffic control and traffic safety?

One way to approach these problems is to insist that they be considered in their proper perspective; that is, as part of a state-wide problem, not an isolated issue. If this view through the right end of the telescope can be taken and maintained on a large scale, the solution to many of our highway deficiency headaches is in sight.

Position of Commissioners

The members of the California Highway Commission are themselves drawn from different sections of the State, each of which has its serious highway problems. Fortunately, we have had the benefit of the state-wide view through repeatedly seeing the fundamental similarity and the interrelationship of these apparently local situations. We do possess individually a special familiarity with the needs of the section of the State from which we hail; but we are in no sense "the Highway Commissioner from" this or that area. The only instruction I have ever received from Governor Warren since he appointed me to the commission in 1943 was: "You are a highway commissioner for all of California." I am sure my colleagues received the same marching order; it is in that spirit that we endeavor to act, and it is that spirit which we must somehow convey to John Doe.

The complexity and scope of the job to be done are tremendous. By the same token, they constitute a tremendous

. . . Continued on page 64

Record Snowfall

Pack on Donner Summit Was 314 Inches on March 20th

A RECORD-BREAKING snow pack of 314 inches was recorded at Donner Summit on U. S. 40 on March 20, 1952. This is the greatest depth of snow reported for this location since accurate observations were first made in 1897. Also on March 20th, the total snowfall at Donner Summit for the current winter reached 776 inches, equaling the fall for the entire winter of 1889-90, which was exceptionally heavy in comparison with the years to follow, and coming within seven inches of the total for the winter of 1879-80. Snowfall during the spring months should push this season's total to a new high.

Exceptional depths of snow were experienced elsewhere throughout the Sierra Nevada Range, as evidenced by the following table:

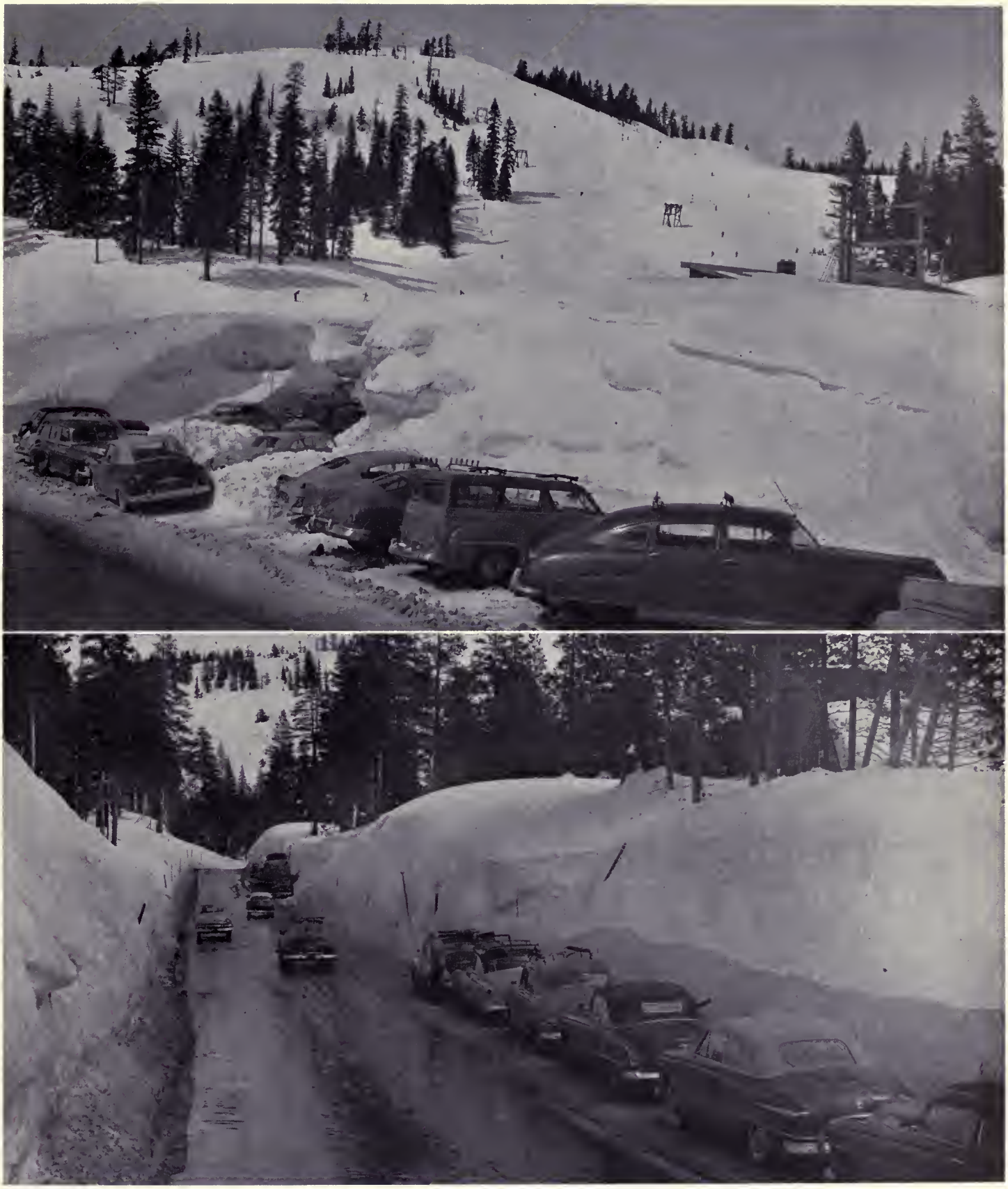
SNOW PACK

Location	Depth, Inches	Date
Mineral Summit (State Sign Route 36)	211	(3-19-52)
Yuba Pass (State Sign Route 49)	245	(3-22-52)
Echo Summit (U. S. 50)	313	(3-20-52)
Peddler Hill (Carson Pass Road) (State Sign Route 88)	263	(3-20-52)

. . . *Continued on page 48*

This photo shows height of snow wall opposite ski resort on U. S. 40 in the Donner Summit area late in March

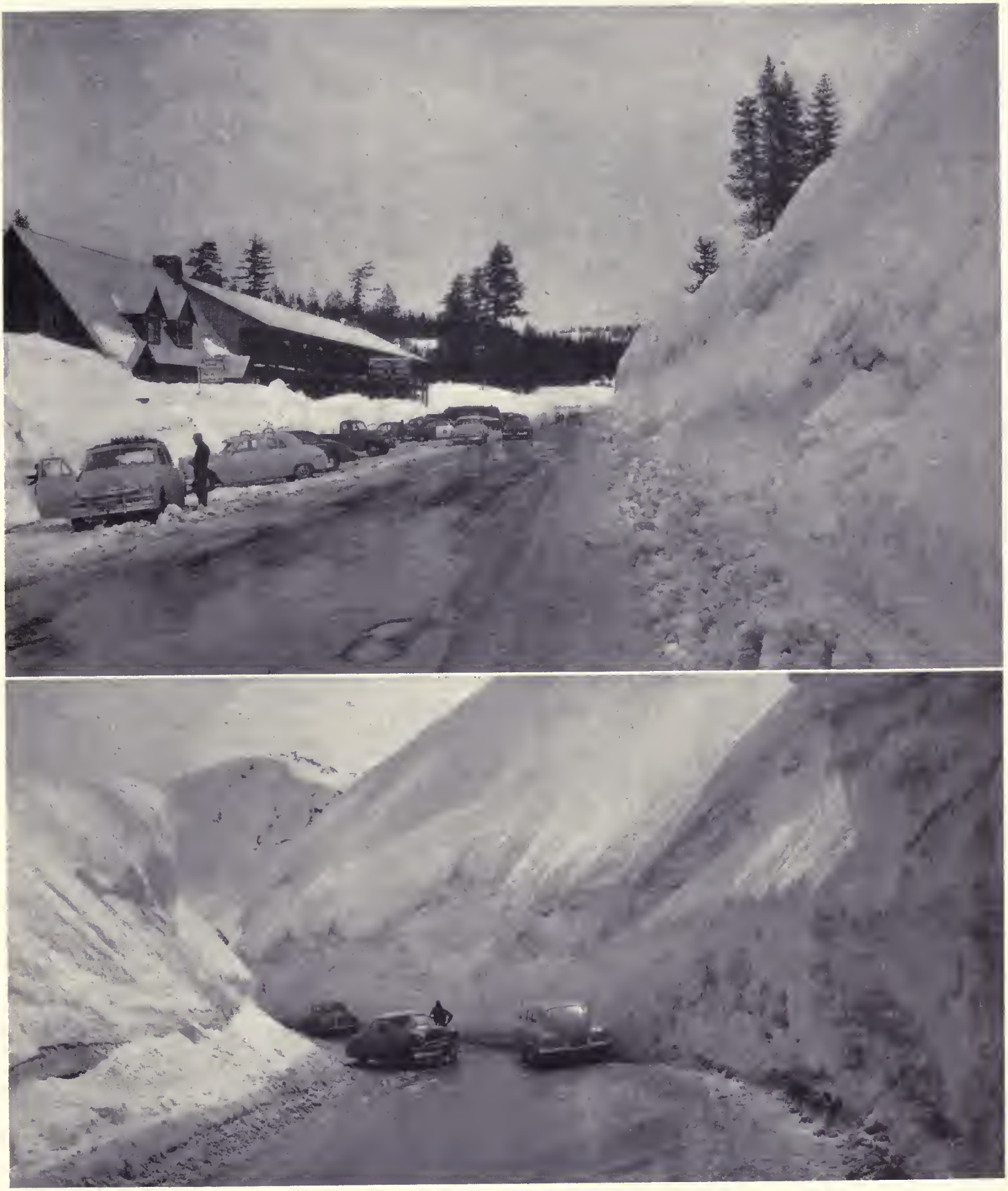




UPPER—Roadside parking at ski resort showing ski lift in background. LOWER—Regulated parking near Sada Springs on U. S. 40.



This striking aerial photo taken by Robert Handsoker of the Sacramento Bee shows maintenance station of Division of Highways on Donner Summit



UPPER—Snaw conditions at end of Morch in resart area west af Donner Summit on U. S. 40. LOWER—Canyon of snaw an Donner Grade, U. S. 40.

Record Snowfall

Continued from page 44 . . .

Camp Connell (Ebbetts Pass Road) (State Sign Route 4)	144	(3-20-52)
Big Stump (Entrance to General Grant Grove) (State Sign Route 180)	180	(3-21-52)
Shaver Lake (Huntington Lake Road) (State Sign Route 16B)	120	(3-17-52)
Deadman Summit (near Crestview) (U. S. 395)	154	(3-15-52)

Additional Storms

Storms during the middle of February and the first three weeks of March continued to add snow along the routes affected by the big January storm. Roads across the Sierra became relatively narrow paths between towering walls of hard-packed snow. These high walls not only complicated the problem of snow disposal but increased the threat of closure by trapping even the slightest drift from surrounding areas.

United States Routes 40 and 50 were closed several times by blizzard conditions or slides of freshly fallen snow, the longest closure for each route being a four-day period in mid-March.

During the same March storm the Feather River Road, State Sign Route 24, was closed for a day between Blairsden and Chilcoot Pass by high wind and drifts.

Points along U. S. 395 in Mono County received an exceptionally heavy fall of snow from the storm starting on March 14th. Eighty-four inches of snow fell in one 24-hour period at Deadman Summit near Crestview. A snowslide near McGee Creek filled a 300-foot long highway cut with 18 feet of snow. A series of snow slides along State Route 111 also hampered the opening of this road between U. S. 395 and the town of June Lake.

CEMENT AND CONCRETE

Publication of a Comprehensive Bibliography on Cement and Concrete is announced by Purdue University. The bibliography covers the 23-year period of the literature, 1925-1947, inclusive and has both a subject and an author index. It contains 40,000 or more references.

State-wide Summary of Water Conditions

California's 1952 snow-melt runoff will be the greatest since the initiation of the state-wide snow survey program in 1930.

Seasonal precipitation to date over the entire State averages about 150 percent of normal with variations from a minimum of 100 percent to a maximum of 200 percent of normal. Areas of greatest percentages of normal are in the vicinities of Bishop in Inyo County and Portola in Plumas County. A heavy March storm brought generous amounts of rain to the general area of recently critical water shortage along the coastal plains between Santa Barbara and San Diego.

Although the Sierra snowpack as a whole contains a volume of water exceeding any heretofore measured on April 1st, the volume on the watershed above Shasta Dam is less than that of April 1, 1938. On watersheds of the Feather, Yuba, and American Rivers, runoff during the April-July period is expected to be the greatest since 1890. It is anticipated that Sierra streams tributary to the northern San Joaquin Valley will produce flows of sufficient magnitude to overflow low lying agricultural lands in the vicinities of their respective confluences with the San Joaquin River. The runoff from Sierra streams tributary to the southern San Joaquin Valley will probably result in depths and extent of submergence in the Buena Vista and Tulare Lake areas approaching those of 1938.

Although appreciable space in major Sierra reservoirs has been evacuated for the purpose of regulating flood flows, it is anticipated that all will fill and some will spill before the end of the period of snow-melt runoff. Only in the south coastal area has the runoff been of insufficient magnitude to insure filling of all reservoirs.

The abundant rainfall and runoff of the past season has resulted in substantial replenishment to most ground water basins of the State. Ground water levels measured about April 1, 1952, were higher in nearly all areas than those of April 1, 1951. Ground water elevations in the San Francisco Bay region were all higher than those of last spring, except in the San Lorenzo area in southern Alameda County where no appreciable change was noted. Water levels in the central coastal area were similarly higher. In the Central Valley, water levels were generally higher than those of a year ago. Increases in water elevations have been noted in most of the unconfined ground water zones of the south coastal area.

Runoff from the major streams of the State have averaged above normal for the six-month period October 1st to April 1st.

Stream Flow

The April-July runoff from snow-fed streams in the Sierra Nevada will be the greatest in many years. The runoff forecasts range from 250 percent of the 62-year normal expectancy on the Kern River Basin to 150 percent on the watershed of the Sacramento River above Shasta Dam. On the latter area the anticipated April-July runoff was exceeded in 1938. On the watersheds of the Feather, Yuba and American Rivers runoff during the April-July period is expected to be the greatest since 1890. On the remainder of the Sierra Nevada south from the American River Watershed the April-July snow-melt runoff will be the greatest since 1906 or 1907 with the exception of the Kern River where greater runoff occurred in 1916. *All the forecasts of total snow-melt runoff contained herein are predicated upon the prevalence of normal weather conditions during the period of runoff.* Forecasted runoff amounts in acre-feet, and in percentage of the 62-year normal, for major Sierra streams are set forth in the tabulation following:

STREAM FLOW FORECASTS—APRIL 1, 1952

Stream	Gaging station	Estimated 1952 flow April-July Acre-feet	Percent normal
Sacramento	Shasta Dam	2,800,000	150%
Feather	Oroville	4,900,000	222%
Yuba	Smartville	2,400,000	199%
American	Fair Oaks	3,150,000	206%
Mokelumne	Mokelumne Hill	1,050,000	198%
Stanislaus	Melones	1,650,000	200%
Tuolumne	La Grange	2,400,000	179%
Merced	Exchequer	1,300,000	185%
San Joaquin	Friant	2,600,000	192%
Kings	Piedra	2,450,000	184%
Kaweah	Three Rivers	600,000	204%
Kern	Bakersfield	1,150,000	253%

CENTRAL VALLEY AREA

The most recent year of comparable snowpack and similar general conditions for estimating maximum daily rates of flow during May and June was 1938. Temperatures during those two months averaged about five degrees above normal. Based on the assumption of a temperature pattern similar to 1938, it is anticipated that the following conditions will prevail in the Central Valley.

SACRAMENTO RIVER BASIN

Stream channels and by-passes in the Sacramento Valley have ample capacity to carry anticipated snow-melt runoff through the reclaimed areas. Minor flooding may be expected in some mountain valleys the Pit and Feather River Watersheds. Within the Sacramento River Flood Control Project water will probably flow over Colusa, Tisdale and Fremont Weirs until about June 1st. Seepage conditions on lands bordering the Sacramento and Feather Rivers will be severe until water in the river channels drops to elevations below natural ground surface.

Some flooding may be expected in a relatively small unprotected area north of the City of North Sacramento from backwater from the Sacramento and American Rivers.

Estimated peak stages and discharges in the Sacramento River Basin during May, 1952, are as follows:

Gaging station	Gage height in feet	Discharge in second-feet
Sacramento River near Red Bluff (Iron Canyon)	8	26,000
Sacramento River at Hamilton City	136	35,000
Sacramento River at Ord Ferry	105	35,000
Sacramento River at Colusa	61	31,000
Feather River, five miles east of Oroville	40	40,000
Yuba River at Marysville	64	——
Sacramento River at Verona	35	50,000
American River at Folsom	15	36,000
American River at "H" Street	35	35,000
Sacramento River at "I" Street	27	85,000

KERN RIVER BASIN

Flows on Kern River passing the City of Bakersfield will probably be in the order of 6,000 to 8,000 second-feet which will cause some overflow into Goose Lake Slough and inundate a narrow strip of agricultural land extending northerly to Sand Ridge at the south end of Tulare Lake. The portion of the Kern River flow remaining in the channel downstream from Goose Lake Slough will be discharged into Buena Vista Lake until the latter is completely filled and will then discharge into Buena Vista Slough to join other Kern floodwaters impounded behind Sand Ridge.

TULARE LAKE BASIN

The Kings and Kaweah Rivers will discharge large volumes of water into the Tulare Lake Sump. Advice has been received from the Corps of Engineers, U. S. Department of the Army, that the partially completed Pine Flat Reservoir will be operated for flood control during the snow-melt period. It is understood that as much as 300,000 acre-feet of flood control space may be available in that reservoir.

SAN JOAQUIN RIVER BASIN

Along the San Joaquin, Merced, Tuolumne and Stanislaus Rivers east of the valley trough there will be minor flooding of river bottom lands on which some agricultural development has taken place.

The operation of Friant Dam has materially altered the regimen of flow of San Joaquin River from that which existed in 1938. Reservoir operation and diversion of about 3,000 second-feet through the canals of the Central Valley Project will materially reduce the quantity of water reaching the Mendota Pool. An additional 2,300 second-feet can be diverted through the canals heading at Mendota Pool. However, some overflow on eastside grasslands is anticipated.

Subject to Inundation

Along that portion of the San Joaquin River traversing the trough of the valley between the Stanislaus and Merced Rivers relatively narrow strips of land along either or both banks of the river are unreclaimed or inadequately protected and will be subject to inundation.

Reclaimed lands along both banks of San Joaquin River downstream from the Stanislaus River to the Banta Carbona Irrigation District intake will probably be inundated when stages at the Vernalis gaging station exceed 26 feet, corresponding to a discharge of about 35,000 second-feet, as is anticipated.

The levees on the left bank of San Joaquin River between Banta Carbona Irrigation District intake and Mossdale Bridge and on both banks of Paradise Cut, although recently improved, should be carefully watched. Failure in this area would disrupt major lines of transportation and cause appreciable damage.

In the Sacramento-San Joaquin Delta the high tides and winds will be of more cause for concern than any rise that might result from snow-melt runoff.

The East Bay Municipal Utility District has advised that Pardee Reservoir on Mokelumne River will be operated to control releases to 5,000 second-feet insofar as is possible. That flow would cause only minor inundation of bottom lands adjacent to the river and of unreclaimed lands at the junction of the Mokelumne and Cosumnes Rivers.

LAHONTAN AREA

The water surface elevation of Lake Tahoe on April 1st was 6227.18. Assuming normal precipitation and temperature conditions for the balance of the season it is estimated by the Truckee Basin Water Committee, which regularly forecasts Lake Tahoe stages, that the lake will rise, with discharges regulated in accordance with the federal court decree, to elevation 6229.1. The maximum elevation should be reached on or about July 31st.

Releases have been made from Lake Tahoe during January, February and March under provisions of the Truckee River Decree and as authorized by the federal court in the amount of 214,000 acre-feet. It is anticipated that additional releases will be made under that authorization during the months April to July, inclusive, in the amount of 350,000 acre-feet. If subnormal or abnormal precipitation conditions prevail the release will be revised accordingly.

. . . Continued on page 56

ANCIENT PICTURES ON ROCKS POSE QUESTIONS

By LAURA ADAMS ARMER *

WHY DID primitive people peck designs on rocks?

A modern artist may answer: "Because they needed to express the beauty they felt. Archeologists surmise that the animal pictures on rocks were magical formulas to bring good hunting. Geographers see maps in some of them. The most beautiful of all pictographs were painted on the walls of caves in Spain and Southern France. Bison, cows, the ibex and prehistoric ponies are recorded by Stone Age artists.

In California and the Southwest, rocks and caves hold the secrets of early Indians who have left spirals, circles, stars, suns, mountain sheep, lizards, frogs, serpents, zigzag lines, dots and dashes hewn in the rocks with stone tools, or painted with color. Savants do not fathom their meaning. Indians know very little about them.

Through copying sand-paintings of the Navaho Indians in Arizona, I am able to interpret a few signs. The medicine men with whom I worked told me what they know. Knowledge that has been handed down from cliff dwelling times. A spiral, if it turns counter-clockwise, represents an evil wind which destroys. A square painted on the back of a reptile represents the house he lives in. Triangles are hoofprints of deer. The summer and winter moons border the house and deer tracks.

On a boulder high in the Southern California Sierra, in Kern County, I found the petroglyphs which were photographed with myself in the foreground. They resemble Owens Valley and Southern Nevada patterns. I should say the zigzag lines portray two rivers which bound some particular location known to the artist. Zigzags mean water in many parts of the world. In the Geographic Magazine for December, 1948, is an article entitled: "Sinai Throws A New Light On the

. . . Continued on page 56

* Internationally known artist and writer now residing in Fortuna, Humboldt County, California.



Walker Pass Road, State Sign Route 178, is a historic route. The western outlet of the pass is situated about 60 miles from the City of Bakersfield. These ancient Indian petraglyphs are to be found near Walker Pass in Kern County. It was through Walker Pass that the famous Bidwell-Bartleson Party (1841) and later emigrant parties made their way across the Sierra Nevada into California. Mrs. Armer views petroglyphs.

PILE DRIVING ON BAYSHORE FREEWAY IS SPECTACULAR

THE PILE DRIVER shown here at Ninth and Bryant Streets in San Francisco is driving one of approximately 550 Bethlehem Pacific steel H-piles that are being used in the abutment and pier foundations for the new $3,500,000 18th Street to Bryant Street Overpass project which is part of the Bayshore Freeway.

All told, approximately 670 tons of H-piles, 40 and 50 feet long are being driven for this section which is expected to be completed in February of next year.

At the Ninth and Bryant Street location, piles have to be driven to a depth of approximately 150 feet because of the softness of the earth down to that level. This is the old Mission Fill which at one time was part of the bay. Fifty-foot lengths of piles are spliced together by means of welding in order to reach firm foundation material.

This nine-tenths of a mile section of the new freeway, which will be an eight-lane divided highway, has connections at Ninth and Tenth Streets, with a one-way off-ramp at Ninth to San Francisco, and a one-way on-ramp at 10th for cars leaving San Francisco.

The whole project is under the supervision of F. W. Panhorst, Assistant State Highway Engineer in charge of bridges, for the Division of Highways.



County Roads

Continued from page 18 . . .

To bring our inadequate surfacing condition up to standards, we could also consider a road bond issue, to be repaid by any of the above means or a special improvement tax.

If the public really desires an immediate improvement in the county road system, serious thought should be given to the above means of financing, otherwise, they should be content with conditions as they now exist and accept them without complaint to those who are charged with the administration. To date Humboldt County has its fourth road commissioner since 1947.

The removal of the old road commissioner and hiring a new one each year will not in itself correct road conditions as they now exist; in fact it will act in the reverse, as the road crew morale will be lowered owing to instability of the administration and lack of faith in the board of supervisors.

Let us all work together for one common cause of better roads with constructive criticism rather than destructive. Good roads are the key to continued increasing prosperity of Humboldt County.

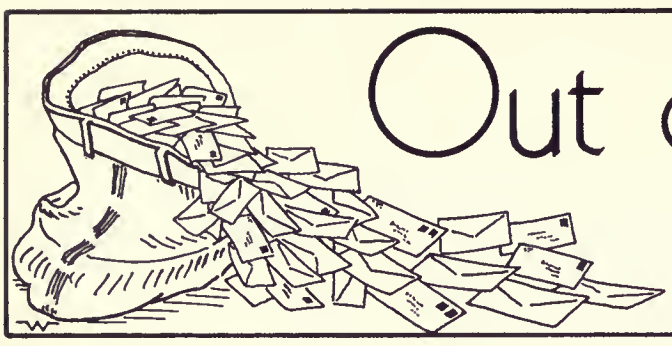
FROM DOWN UNDER

CHAMPIONS LIMITED
113-119 Currie Street, Adelaide

DEAR SIR: I wish to express my appreciation of your monthly publication, *California Highways and Public Works*.

This magazine is read by a number of clients who are road constructors and they have gained considerable knowledge from the reading of this publication.

E. O. JANSEN, *Sales Director*



Out of the Mail Bag

RECALLS BOYHOOD DAYS

OFFICE OF
COUNTY ASSESSOR
OF SACRAMENTO COUNTY
COURTHOUSE
Sacramento 14, California

Mr. Kenneth C. Adams, Editor
California Highways and Public Works
Sacramento, California

Dear Sir: I have been very much interested in your November-December issue of *California Highways and Public Works*. The section entitled "Photogrammetry" was especially interesting as the pictures show where I was born and lived for about 17 years. I can spot the location of the old house of my grandmother, the schoolhouse where I attended grammar school—we thought we were going to have many happy days when the schoolhouse burned down, but of course they found other places for us to go until a new school was built. The hill shown in the northeast corner of the map was used for flying kites when I was a youngster. The remains of the old Pacific Coast railroad right of way still shows very distinctly. I was a locomotive fireman on that road when I was 18 years old.

In addition the section entitled Shell Beach Study was very interesting as I, as a boy, helped harvest beans in the area where the town site is located. The ranch house of the former owner of this property shows very plainly in the photograph. In those days we did not think the abalones, which were very plentiful there, were good for eating, the shells being the only useful part.

Yours very truly,

Harry M. Wood,
County Assessor

BALANCING ROCK

W. W. MAULE
Minden, Nevada

Kenneth C. Adams, *Editor*

Dear Mr. Adams: In your November-December Vol. 30, Mr. Munroe's cover page "Balancing Rock" brings back memories of 1924 while I was forest supervisor of the Mono National Forest and the year that I had supervision of building what was designated the "Reversed Creek Road," a six-mile link from June Lake Junction to S. S. power house at Silver Lake.

Portions of the road roughly followed a cowpath and the structure we emplaced has held mainly to the present link. The huge cost to the Forest Service was $6,000. A team Fresno moved the grade material and certain hard rock work was blasted by hand drills.

The perched boulder shown was brought into place by a post-glacial glacier which Israel C. Russell describes in "Quarternary History of Mono Valley in Eighth Annual Report of U. S. G. S.—1886-87." That glacier corked up a small stream by moraine north of the boulder and caused it to return into Rush Creek.

Very truly yours,

William M. Maule

GOOD ROADS

Mr. George T. McCoy
State Highway Engineer

I have been driving over California highways since 1909. The great improvements one sees are almost unbelievable. Of course, every state recognizes California's leadership in building good roads.

John J. Lynch
Oakland, California

PLUMB BOB POINTS

SUVERKROP INSTRUMENTS
P. O. Box 436, Bakersfield, California

Mr. Kenneth C. Adams, *Editor*

Dear Mr. Adams: The November-December issue of your fine magazine, with the article on Standard Plumb Bob Points, has just been brought to my attention. This is a very important contribution to a very worthwhile effort, and especially so in view of both the circulation of your magazine among people concerned and the fact that it is an altogether independent write-up.

Mr. McGinnis is certainly to be congratulated for the clarity and engaging style of his writing. His article will go a long way in these final stages of making this plumb bob point universally accepted as the national standard.

In writing you thus I think I am only expressing the feelings of all plumb bob users and directors of work in which plumb bobs are used, as well as those of the numerous distributors and manufacturers who have pioneered the standard point. Sincere thanks from all of us.

Lew Suverkrop,
Engineer

HOW TRUE

Editor

The Nov.-Dec. issue carries a sad commentary on adult delinquency. Beautiful scenery is marred with the debris tossed from cars by selfish slovenly men and women who must be admonished by the Highway Department to be more thoughtful, as though they were overgrown children.

Sad commentary, indeed.

Joseph Kinsel
4988 Mt. Royal Drive
Los Angeles, Calif.

COMPLIMENT FOR ENGINEERS

COLONEL GEORGE RUHLEN
2244 Plum Street
San Diego 6, California

Mr. Kenneth C. Adams, *Editor*

Dear Mr. Adams: Thanks very much for placing may name on the mailing list of California Highways and Public Works.

The articles on up-to-date engineering practices indicate our highway authorities are keeping close touch with the best modern theories and the results are evident to anyone traveling California highways. This confirms my previous high regard for the highway engineers with whom I have had pleasant associations in the past.

In addition to matters of local interest in the current issue, especially the new Oceanside-Carlsbad Freeway, the historical references which frequently appear in your publication are also interesting to one afflicted with an historical avocation, as is your correspondent.

Very truly yours,

George Ruhlen

LIKES MAGAZINE

THE UNION METAL MANUFACTURING CO.
Canton, Ohio

Mr. Kenneth C. Adams, *Editor*

Dear Mr. Adams: I want to thank you for the copies of the fine publication that reaches my desk. It is read with great interest by me as well as others in our organization.

This magazine keeps me abreast with the excellent program that the Highway Department is continuously carrying on—a program that gives the kind of roads to your citizens and visitors that makes your highways an example to many other states. Also, many of the articles are written by friends of mine in the Highway Department whom I do not get to see very often except at AASHO meetings.

Our company is proud to be the supplier of some of the poles and piling for your modern projects.

We wish you all a happy and successful 1952.

Sincerely yours,

W. A. Porterfield
Vice President

FROM LONDON

LONDON

January 23, 1952

Kenneth C. Adams Esq.,
California Highways and Public Works,

Dear Mr. Adams, we here in London all look forward to receiving your excellent magazine and would take the opportunity of thanking you for continuing to mail it to us.

We take the liberty of sending round our copy throughout the group of companies and, thereafter, it finds a place in the Royal Automobile Club in London where it is read by many interested people.

Fortunately, I am a frequent visitor to California and to Sacramento and am therefore able to see the many magnificent achievements carried out by the California Highways Department but, for the rest of us your magazine is the only medium to show our people the wonderful job of work which is being carried out in the most beautiful state in America.

Our most sincere good wishes for 1952 and beyond,

A. J. F. Andrews
Managing Director.

LIKES MAIL BAG

2610 W. 60th Street
Las Angeles 43, California

Mr. Kenneth C. Adams, *Editor*

Dear Sir: I have received several issues of your magazine and being employed by the City of Los Angeles in the Public Works Department causes me to read your magazine with keen interest, as new asphalt construction is our business.

Your magazine is the best in its field and it would be difficult to estimate its value to your readers. Such a magazine is an integral part of our California highway progress.

I read with interest that part of California Highways Public Works, "Out of the Mail Bag" and you must be immensely pleased to receive such letters. It must be a pleasure for you to pass along these letters of fine expression to those that help make the California Highways and Public Works a wonderful magazine.

Very Sincerely yours,

Chas. L. Dorsey

FOR CLEAN HIGHWAYS

P. O. Box 18-A
Buellton, California

California Highways and Public Works
Sacramento, California

Dear Sirs: I thought you would be interested in knowing that the Solvang Women's Club is very much interested in a roadside clean-up in the Santa Ynez Valley. They have appointed a committee of which I am chairman. Many motorists using the highways are very thoughtless and throw bottles, beer cans, and other rubbish by the wayside. This increasing carelessness should be brought to public attention. Possibly some means could be found to end this practice.

In our own valley we have approached the Division of Highways engineer, and the supervisors. We hope once these departments have the opportunity to "rake" up, we may be of help with an educational program through the schools. It is hoped to cover this ground by Easter.

Very truly,

Tlita de la Cuesta

FROM CANADA

ONTARIO
DEPARTMENT OF HIGHWAYS

Toronto, Canada
February 4th, 1952

Mr. Kenneth C. Adams, *Editor,*
California Highways and Public Works,
Sacramento, California

Dear Mr. Adams: I have been receiving copies of your very fine publication, *California Highways and Public Works* and wish to take this opportunity to express my appreciation.

Your magazine is most interesting, well illustrated and of the highest standard.

Thanking you, very truly yours

Thomas E. Mahony
Traffic Division

HISTORY OF UNITED STATES NUMBERED HIGHWAYS

By M. A. O'BRIEN, Highway Signing Supervisor

To THE MANY historical events credited to San Francisco we find, upon investigation, that our present system of U. S. numbered highways may be added as it also had its origin in that city. While the idea was previously conceived and discussed by the officials of the Bureau of Public Roads and many state highway officials, the first step leading to the development of an interstate highway system was brought forth at the annual meeting of the American Association of State Highway Officials held in San Francisco during November, 1924.

There was a definite need for the marking of interstate highways and routes of travel which was partially satisfied by the various trail associations. Many individuals sought to capitalize on the popular demand for interstate and cross-country routes by organizing trail associations, collecting large sums of money from our citizens, and giving practically no service in return. This action discredited the many reputable trail associations which had heretofore rendered a distinct public service by stimulating highway improvement.

Haphazard Naming

Some of these organizations proposed routes through cities and towns that had contributed to their cause even though the route selected and identified would not be the most direct and best way for through travel. The old method of giving names to various highways prevented any uniform system of marking since highway names frequently were not continued into adjoining states and in several instances the same major highway would have two or more names in one state. Civic-minded groups vied with each other in naming various highways. Roads were named as the result of political pressure more often than for historical reasons. Too frequently local names were assigned a highway without markers of any kind being placed to identify the route. Local groups in one section often disagreed with other areas on the choice of a name. It frequently happened that this difference of opinion between neighboring groups was a source of considerable embarrassment to highway officials who now universally accept the system of highway numbering. Mr. Herbert Hoover, when Secretary of Commerce, is credited with making the original suggestion to establish a system of U. S. numbered highways.

A. A. S. H. O. Takes Action

The American Association of State Highway Officials in the San Francisco meeting of 1924, heard a paper on the subject of Interstate Highways presented by E. W. James, Chief of the Division of Design for the Bureau of Public Roads. This original report by Mr. James was approved and the state highway officials, on November 20, 1924, adopted the following resolution:

"This association hereby requests the Secretary of Agriculture, in cooperation with the several states, to undertake immediately the selection and designation of a comprehensive system of through interstate routes and to devise a comprehensive and uniform scheme for designating such routes in such a manner as to give them a conspicuous place among the highways of the Country as roads of interstate and national significance.

"To more satisfactorily carry out these suggestions and obtain speedy and satisfactory results, this association requests the Secretary of Agriculture to appoint a board to be composed of members of the Bureau of Public Roads and of the state highway departments to cooperate in formulating and promulgating a system of numbering and marking highways of interstate character."

Board Appointed

This resolution was presented to the Secretary of Agriculture. He concurred, and on March 2, 1925, appointed a board to make a study and submit recommendations. Thomas H. MacDonald, Chief of the Bureau of Public Roads, was named as Chairman; E. W. James, Chief of the Division of Design, Bureau of Public Roads, was named as Secretary; the other members were highway officials nominated from 21 states.

The various state representatives were divided into six regional groups, which acted on highways within the states embraced in their respective geographical areas. The 11 western states were named the "Western Group" and were represented by Robert M. Morton, State Highway Engineer for California; Roy Klein, State Highway Engineer for Oregon; Preston G. Peterson, Chairman, State Road Commission for Utah; James A. French, State Highway Engineer for New Mexico.

Similar groups were formed for other sections of the Nation as follows: Mississippi Valley Group representing 11 states; Lakes Group representing six states; Southern Group representing nine states; North Atlantic Group representing five states; and the New England Group representing six states. These groups had their meetings and reported to a Joint Board on Interstate Highways.

First Joint Board Meeting

The first full meeting of the joint board was held in Washington, D. C., on April 20, 1925. Resolutions were adopted which formed the basis for designation of the system of United States highways. The board recommended the immediate selection of transcontinental and interstate routes from the Federal Aid Road System and that these routes be continuously designated by means of a standard highway marking sign. It voted, also, that a system be established and marked to satisfy the demand for marked routes on the part of transcontinental and interstate traffic. This marking was to meet a need which in the past had been partially satisfied by the marked trails,

established by various trails associations. It was further voted to allow the several states to continue the marking of existing trails and memorial highways pending the establishing of the proposed marking system unless such action would conflict with the marking systems and policies now in force in the several states. A resolution "that no trail association be permitted to establish further routes on state or federal-aid routes" was adopted.

Signs Adopted

A second meeting of the joint board was held in Washington, D. C., on August 3, 1925, which adopted the reports and recommendations of the six territorial groups. The numbering system was adopted at this meeting. Our present standard U. S. shield with a white background and black lettering and a system of uniform warning, regulatory, and directional signs were also adopted for installation on these interstate highways.

As a basis for selecting the highway routes for the various states, it was decided that the mileage of these U. S. highways be confined to not more than 3 percent of the total certified rural miles within a state. At that time, the federal-aid system consisted of interstate and intercounty roads and was limited to 7 percent of the total mileage of rural roads then existing. The certified miles of rural highways in California in 1925 totaled 70,000 miles. The Western Group, in its meeting, had designated 2,599 miles in California as U. S. highways which was 3.7 percent of the certified miles. However, the joint board which met in Washington, D. C., in August, 1925, reduced this group selection to 2,220, or 3.1 percent of the certified miles to be the U. S. Highway System in California.

Routes Selected

The findings and report of the joint board was presented to the American Association of State Highway Officials at its annual meeting held in Washington, D. C., in November, 1926. A resolution was adopted at that time to proceed with the program as submitted by the joint board.



Even numbered U. S. routes run east and west. This shows sign on U. S. 40

The committee assigned all odd numbers for highways which run in a north and south direction and assigned even numbers for highways which run east and west. The lowest east and west numbers parallel the Canadian border.

The routes and numbers selected were referred to the various state highway departments for review as to the extent and general location of the U. S. routes to be marked. It was felt that each state highway department should select the best available routes and locate U. S. highways over roads where proposed improvements and realignments would be made.

In California

The original selection consisted of 76 primary highway routes throughout the United States. U. S. Highway 1 was to follow the Atlantic Coast, and U. S. Highway 101 to follow the western coast of California. It was found necessary and advantageous to have some U. S. highways as connecting laterals between other major routes. Where this has been done, the number of the major route is retained and the lateral route has the addition of a third digit. One example of this system in California is applied to U. S. Highway 99, the main north and south route which passes through the central part of California. The number "99" has been retained to mark three of the laterals; we therefore have U. S. Highway 199, U. S. 299, and U. S. 399, all of which connect U. S. 99 with some other U. S. highway.

(To be continued)

Ancient Pictures

Continued from page 50 . . .

Bible," Prof. W. F. Albright of Johns Hopkins University in a table of signs based on his studies, says that Sinaitic writing on the rocks is the oldest in our alphabet. He calls the zigzag, water. Also the square is house in old Sinai.

When I was writing and painting in the Black Mountain section of the Navaho reservation, I made the acquaintance of an up-to-date chiseler of the sandstone cliffs not far from my house. This man was a lover of horses. He had drawn several life-size portraits of his pony on the walls of the canyon and finished his mural with a mountain lion, the soft-footed chief of Navaho medicine men. I know that the Indian carved those animals on the rocks because of his admiration for their forms. If, a thousand years from now they still exist, I wonder what archeologists will say about them. I shall have my say now.

They are the expressions of the artist's emotional delight in the creatures of the good Mother Earth.

Summary of Water Conditions

Continued from page 49 . . .

The Los Angeles Department of Water and Power has forecast runoff for the hydrographic year in the Owens River Watershed to amount to 170 percent of their long-term mean; the Mono Basin Watershed excluding Mill Creek to amount to 180 percent of the long-term mean; and the average runoff from the Inyo-Mono area to average 172 percent of the long-term mean.

COLORADO DESERT AREA

According to advice received from the Office of River Control, U. S. Bureau of Reclamation, Boulder City, Nevada, snow survey and precipitation data available on April 1st indicated an anticipated runoff at the Grand Canyon gaging station of from 13,400,000 acre-feet to 16,200,000 acre-feet. That agency further advised that it believed the flood control requirements below Lake Mead would be met.

Sign Language

The motorist who doesn't believe in signs is inviting trouble when he heads his car into California snow country.

The State Division of Highways has a special "sign language" for the 4,000 miles of state-maintained highway on which snow and ice are a constant or a recurring hazard every winter, and most of the signs move up and down the mountain slopes along with the snowline.

There is sound basis in state law, experience and common sense behind these signs which tell the motorist where to put on chains and where to park while doing so.

Reaching suitable winter sports areas often requires driving over miles of icy mountain road. This means the use of skid chains.

First Warning

The first specific warning a motorist will encounter in snow country is a rectangular sign with reflectorized black letters on a yellow background reading "CHAINS REQUIRED 1 MILE AHEAD."

The Division of Highways tries, whenever possible, to place these signs near roadside developments such as garages or service stations where chains either can be rented or the motor vehicle driver can put on his own and not have to park on the traveled way to do so.

Farther along, at the actual chain-control point, there is a sign reading "STOP — VEHICLES WITHOUT CHAINS ON REAR WHEELS PROHIBITED." This rectangular sign is of reflectorized porcelain enamel with a white STOP on a red background. The remaining letters are black on white.

This sign (following the former wording of the statute in the Vehicle Code) in the past read simply "VEHICLES WITHOUT CHAINS PROHIBITED." However, this had to be changed when wiseacres, after being accosted, would exhibit chains neatly stored away under the seats of their cars and claim compliance with the law on the grounds that it mentioned nothing about having the chains actually on the wheels of the car.

Highway maintenance men and officers of the California Highway Patrol who have seen fatal smashups caused by failure to use chains along ice-covered pavements have been understandingly slow to see the humor in this attempt to evade the spirit of the law. To avoid trouble, however, the law, and consequently the signs, were made more specific by adding three words: "ON REAR WHEELS."

Quite frequently, the division posts a black-on-yellow reflectorized sign reading "CHAINS ADVISABLE." Highway engineers point out that this sign is a warning to all drivers not thoroughly familiar with snow conditions. If you're a newcomer to the snow areas better play it safe and put on your chains, even though the only law behind the "advisable" sign is the unwritten law of self-preservation.

Motorists entering snow sports areas will come across locations where the snow has been removed from the shoulder of the road for a sufficient distance to permit parking. These spots are identified by rectangular black-on-white signs reading "PARK OFF PAVEMENT."

In places where the narrowness of the road makes it impossible to park clear of the pavement, the Division of Highways places red-on-white "NO PARKING" or "NO PARKING AT ANY TIME" signs, usually with an arrow underneath the letters to indicate the limit of the NO PARKING section.

Cars left parked, unattended and locked on the traveled way cause some of the biggest headaches which plague highway workers—and other motorists. They not only create a hazard but often make it impossible for other traffic, particularly the all-important snow-plow, to get through. During the



Winter brings a special "sign language" to the California mountain routes maintained by the State Division of Highways. By heeding these and other official roadside admonitions, tourists, winter sports fans and other motorists can enhance their driving pleasure and especially their safety, and also prevent serious traffic tieups.

recent pre-New Years storm, a few thoughtless motorists who parked and locked their cars on the pavement on U.S. Highway 40 bottled up hundreds of other vehicles for long periods and actually were responsible for closing the route for 36 hours.

Where large spaces at the side of the road have been leveled and cleared for parking, the Division of Highways places portable black-on-white signs stating "BEGINNING OF PARKING AREA" and "END OF PARKING AREA."

When leaving the chain-control areas motorists are notified by a black-on-yellow sign reading "END OF CHAIN CONTROL." This means that chains can be removed. This sign is posted at the first safe location below the danger area so that the motorist will not have to drive for any great distance over dry pavement with the resulting wear on both chains and tires.

Routes not kept open during the winter months are marked at control intersections or other advance points by rectangular black-on-white signs stating that the route or pass is closed by snow beyond a certain point.

For example, a driver heading east along State Sign Route 108 will encounter signs reading "SONORA PASS CLOSED BY SNOW BEYOND PINECREST." The word PINECREST may be on a detachable plate, so that it can be replaced by the name of some other point as snow conditions change.

California's experienced snow-removal crews and the California Highway Patrol are unanimous in one thing: When it comes to driving through ice and snow, warning signs are a motorist's best friend. Treat them with respect. Take what they say seriously. It could add years to your life.

STANDARD HIGHWAY DEFINITIONS FOR ALL STATES

Freeway—An expressway with full control of access.

Parkway—An arterial highway for non-commercial traffic, with full or partial control of access, and usually located within a park or a ribbon of parklike development.

Expressway—A divided arterial highway for through traffic with full or partial control of access and generally with grade separations at intersections.

These are three of many highway definitions recommended by the special committee on nomenclature of the American Association of State Highway Officials and approved as a policy of the association. Other definitions are:

Highway, Street or *Road*—A general term denoting a public way for purposes of vehicular travel, including the entire area within the right-of-way.

(*Recommended usage:*
in urban areas—highway or street
in rural areas—highway or road)

Arterial Highway—A general term denoting a highway primarily for through traffic, usually on a continuous route.

Control of Access—The condition where the right of owners or occupants of abutting land or other persons to access, light, air, or view in connection with a highway is fully or partially controlled by public authority.

Full control of access means that the authority to control access is exercised to give preference to through traffic by providing access connections with selected public roads only and by prohibiting crossings at grade or direct private driveway connections.

Partial control of access means that the authority to control access is exercised to give preference to through traffic to a degree that, in addition to access connections with selected public roads, there may be some crossings at grade and some private driveway connections.

Major Street or *Major Highway*—An arterial highway with intersections at grade and direct access to abutting property and on which geometric design and traffic control measures are used to expedite the safe movement of through traffic.

Through Street or *Through Highway*—Every highway or portion thereof at the entrance to which vehicular traffic from intersecting highways is required by law to stop before entering or crossing the same and when stop signs are erected. (Uniform Vehicle Code, Act V)

Local Street or *Local Road*—A street or road primarily for access to residence, business, or other abutting property.

Divided Highway—A highway with separated roadways for traffic in opposite directions.

Belt Highway—An arterial highway for carrying traffic partially or entirely around an urban area or portion thereof. (Also called circumferential highway.)

Radial Highway—An arterial highway leading to or from an urban center.

Frontage Street or *Road*—A local street or road auxiliary to and located on the side of an arterial highway for service to abutting property and adjacent areas and for control of access.

Toll Road, Bridge, or *Tunnel*—A highway, bridge, or tunnel open to traffic only upon payment of a direct toll or fee.

Cul-de-sac Street—A local street open at one end only and with special provision for turning around.

Dead-end Street—A local street open at one end only without special provision for turning around.

ELEMENTS OF THE CROSS SECTION

Roadway — (General) The portion of a highway, including shoulders, for vehicular use. A divided highway has two or more roadways.

(In construction specifications) The portion of a highway within limits of construction.

Roadbed—The graded portion of a highway, usually considered as the area between the intersections of top and side slopes, upon which the base course, surface course, shoulders, and median are constructed.

Subgrade—The portion of the roadbed prepared as a foundation for the base or surface course.

Median—The portion of a divided highway separating the traveled ways for traffic in opposite directions.

Traveled Way—The portion of the roadway for the movement of vehicles, exclusive of shoulders and auxiliary lanes.

Shoulder—The portion of the roadway contiguous with the traveled way for accommodation of stopped vehicles, for emergency use, and for lateral support of base and surface courses.

Roadside—A general term denoting the area adjoining the outer edge of the roadway. Extensive areas between the roadways of a divided highway may also be considered roadside.

Traffic Lane—The portion of the traveled way for the movement of a single line of vehicles.

Auxiliary Lane—The portion of the roadway adjoining the traveled way for parking, speed-change, or for other purposes supplementary to through traffic movement.

Parking Lane—An auxiliary lane primarily for the parking of vehicles.

Speed-change Lane—An auxiliary lane, including tapered areas, primarily for the acceleration or deceleration of vehicles entering or leaving the through traffic lanes.

Median Lane—A speed-change lane within the median to accommodate left-turning vehicles.

Outer Separation—The portion of an arterial highway between the traveled ways of a roadway for through traffic and a frontage street or road.

TRAFFIC TERMS

Passenger Car—A motor vehicle designed for the transportation of not

more than eight persons. The term includes taxicabs, limousines, and station wagons.

Bus—A self-propelled motor vehicle designed for the transportation of more than eight persons.

Trolley Coach—A motor vehicle, designed for the transportation of persons, which is propelled by electric power from overhead trolley wires but not operated upon rails.

Streetcar—A vehicle designed for the transportation of persons and operated upon rails principally in municipalities.

Truck—A general term denoting a motor vehicle designed for transportation of property. The term includes single unit trucks and truck combinations.

Truck Combination—A truck tractor and a semitrailer, either with or without a full trailer, or a truck with one or more full trailers.

Light Delivery Truck—A single unit truck, such as a panel or pick-up truck, with size and operating characteristics similar to those of a passenger car and commonly used for short-haul light delivery service.

Parked Vehicle—A vehicle stopped for temporary storage.

Standing Vehicle—A vehicle stopped for a brief interval as when loading or unloading.

Curb Loading Zone—Roadway space adjacent to a curb and reserved for exclusive use of vehicles during loading or unloading of passengers or property.

Traffic Control Device—Any sign, signal, marking, or installation placed or erected under public authority, for the purpose of regulating, warning, or guiding traffic.

Traffic Sign—A traffic control device mounted on a support above the level of the roadway that conveys a specific message by means of unchanging words or symbols.

Traffic Marking—A traffic control device consisting of lines, patterns or colors on the pavement, curbs, or other objects within or adjacent to the roadway, or words or symbols on the pavement.

Traffic Signal—A power-operated traffic control device by which traffic is regulated, warned, or alternately directed to take specific actions.

Traffic Control Signal—A traffic signal by which traffic is alternately directed to stop and to proceed.

Delay—The time lost while traffic is impeded by some element over which the driver has no control.

Operational Delay—Delay caused by interference between components of traffic.

Fixed Delay—Delay caused by traffic controls.

Speed—The rate of movement of a vehicle, generally expressed in miles per hour.

Average Spot Speed—The arithmetic mean of the speeds of all traffic, or component thereof, at a specified point.

Over-all Travel Time—The time of travel, including stops and delays except those off the traveled way.

Running Time—The time the vehicle is in motion.

Over-all Travel Speed—The speed over a specified section of highway, being the distance divided by over-all travel time. The average for all traffic, or component thereof, is the summation of distances divided by the summation of over-all travel times.

Running Speed—The speed over a specified section of highway, being the distance divided by running time. The average for all traffic, or component thereof, is the summation of distances divided by the summation of running times.

Design Speed—A speed determined for design and correlation of the physical features of a highway that influence vehicle operation. It is the maximum safe speed that can be maintained over a specified section of highway when conditions are so favorable that the design features of the highway govern.

Merging—The converging of separate streams of traffic into a single stream.

Diverging—The dividing of a single stream of traffic into separate streams.

Weaving—The crossing of traffic streams moving in the same general direction accomplished by merging and diverging.

Volume—The number of vehicles passing a given point during a specified period of time.

Density—The number of vehicles per mile on the traveled way at a given instant.

Headway—The time interval between passages of consecutive vehicles moving in the same direction by a given point.

Spacing—The distance between consecutive vehicles measured front to front.

Design Volume—A volume determined for use in design, representing traffic expected to use the highway. Unless otherwise stated, it is an hourly volume.

Average Daily Traffic—The average 24-hour volume, being the total volume during a stated period divided by the number of days in that period. Unless otherwise stated, the period is a year. The term is commonly abbreviated as ADT.

Thirtieth Highest Hourly Volume—The hourly volume that is exceeded by 29 hourly volumes during a designated year. (Corresponding definitions apply to any other ordinal highest hourly volume, as tenth, twentieth, etc.)

Basic Capacity—The maximum number of passenger cars that can pass a given point on a lane or roadway during one hour under the most nearly ideal roadway and traffic conditions that can be attained.

*Possible Capacity**—The maximum number of vehicles that can pass a given point on a lane or roadway during one hour under the prevailing roadway and traffic conditions regardless of their effect in delaying drivers and restricting their freedom to maneuver.

Practical Capacity — The maximum number of vehicles that can pass a given point on a lane or roadway during one hour under the prevailing roadway and traffic conditions, without unreasonable delay or restriction to the drivers' freedom to maneuver.

Design Capacity—The practical capacity or lesser value determined for use in designing the highway to accommodate the design volume.

NAVY APPRECIATION

U.S.S. LOS ANGELES CA-135
c/o Fleet Post Office

VALLEJO, CALIFORNIA,
14 February, 1952

California Highway Commission
Los Angeles, California

GENTLEMEN: This is by way of a compliment to the people responsible, for their comprehensive traffic analysis and placement of easily read and understood traffic signals and directives.

Realizing the difficulties involved due to the large number of autos and limited space in Los Angeles streets (and being out-of-state drivers), we anticipated a certain amount of difficulty in driving in Los Angeles County, because of the immense volume of motor vehicles and our unfamiliarity with streets and directions.

However, such was not the case. Due to the excellent freeways, signals and fast-flowing traffic, we were able to maneuver with as much ease as if we had been driving in this area for years.

Our thanks go also to the courteous, efficient and helpful police officers, both in the city and on the highways. Their handling of traffic during the rush hours is especially gratifying.

Sincerely,

W. H. OMER, USN
Houston, Texas
J. V. CALDERSON, USN
Del Rio, Texas
F. J. TUK, USN
Latrobe, Penna.

State Auto Influx Up 10 Percent In First Quarter

AN ALL-TIME high of 277,240 out-of-state cars entered California during the first three months of this year, bringing 704,828 persons into the State.

The car influx is a 10 percent increase over the previous high of 251,074 set last year, the Touring Bureau of the Automobile Club of Southern California announces.

The number of passengers to enter California in out-of-state cars during the first quarter is also the highest in history, topping the 1951 record year of 634,649 by nearly 17 percent.

Southern California border stations checked through 185,087 of the total number of cars and 479,420 of the passengers.

The three-month breakdown showed the following totals of out-of-state vehicles entering California in 1952: January, 89,578; February, 92,287; March, 95,375. Each represented new monthly highs.

State Victory

Continued from page 19 . . .

as a freeway within the meaning of Section 23.5 of the Streets and Highways Code defining a freeway.

Speaking of the freeway declaration the court continues:

"The construction of the freeway pursuant to the resolution did not create new rights of access in favor of land which did not abut upon the highway as it formerly existed. Where an ordinary or conventional road is built, there may be an intent to serve abutting owners but when a freeway is established the intent is just the opposite, and a resolution creating a freeway gives adequate notice that no new rights will arise unless they are specifically granted."

Landmark in Litigation

In its opinion in the *Schnider* case, the court is careful to point out two specific situations which were not involved therein. The court stated it was not concerned with a situation in which the owner of property abutting upon a conventional highway is deprived of direct access when it is rebuilt as a freeway, and also that the *Schnider* case did not involve the question of what rights of access plaintiffs would have acquired if the boulevard had been widened and rebuilt as a conventional highway.

While the decision in the *Schnider* case merely confirmed the department's long standing interpretation of the law, it does stand as a landmark in litigation relating to freeways, since it is the first case in the United States which squarely decides the point involved.

DEMISE OF A COYOTE

It has been a hard winter, men. Even a coyote froze to death. Well, maybe he didn't freeze. Maybe his restricted quarters interfered with his normal diet of mice, jackrabbits and ranchers' chickens. Might be that a few snootfulls of invigorating Modoc winter air would have kept his tuneful presence among us. But anyhow he's dead. His untimely demise was discovered this-a-way:

Last year Prison Camp No. 39 north of Alturas put a 60-inch culvert in the new road at Dry Creek. This is about eight miles north of the Cedarville junction. The first snow and wind this winter plugged it shut and every storm increased the drifts. This was observed by Bill Stout, the camp superintendent. However, he was busy fighting snow to keep the road open, pulling out stalled trucks and hauling surfacing material to bolster the surface on sections of highway not completed last year. Furthermore, he had no great hope that it was ever going to quit snowing or warm up. Blocked culverts wouldn't make any difference anyway.

Finally, there came a day. It didn't snow. A flock of wild geese flew over. Bill consulted the calendar and refreshed his memory. Very skeptically, he decided it might be a good idea to open that Dry Creek culvert. Just an off chance you understand, that some day the snow might melt. He sent a crew down to shovel the snow out of both ends. There in the middle of the pipe they found Don Coyote.—*Contributed by District II, Division of Highways.*

The California Division of Highways operates 220 pieces of special snow removal equipment, in addition to 190 sanders and other devices for reducing accident hazards on icy highways.

HIGHWAY BIDS AND AWARDS

December, 1951

ALAMEDA AND CONTRA COSTA COUNTIES—At Broadway Low Level Tunnel, portions of tunnel ventilating and illuminating equipment to be cleaned and painted. District IV, Route 75, Section Oak, A. M. Williams & Sons, Inc., Oakland, $25,280; Deemer & Deemer, San Francisco, $27,600; J. S. Morris Co., Berkeley, $33,300. Contract awarded to R. W. Reade & Co., Berkeley, $14,604.

FRESNO COUNTY—On Blackstone Avenue between Olive Avenue and ¼ mile north of Shields Avenue in Fresno, about 1.8 miles to be graded and surfaced with plant-mix surfacing on untreated rock base and drainage pumping system to be installed. District VI, Route 125, Section Fre, C. Baun Construction Co., Fresno, $427,568; Guy F. Atkinson Co., South San Francisco, $463,875; M. J. B. Construction Co., Stockton, $475,739; Leo F. Piazza Paving Co., San Jose, $480,537; M. J. Ruddy & Son, Modesto, $528,096. Contract awarded to Gene Richards, Fresno, $411,957.46.

KERN COUNTY—Between McFarland and Delano Underpass, about 5.5 miles to be graded and paved with Portland cement concrete on cement treated subgrade, existing pavement to be surfaced with plant-mix surfacing over untreated rock base and drainage structures to be constructed. District VI, Route 4, Section F. Peter Kiewit Sons' Co., Arcadia, $908,216; J. E. Haddock, Ltd., Pasadena, $954,242; Fredrickson & Watson Construction Co., Oakland, $1,016,473; Rice Bros. Inc., Marysville, $1,020,867; Gordon H. Ball & San Ramon Valley Land Co. & Ball & Simpson, Berkeley, $1,028,367; M. J. B. Construction Co., Stockton, $1,054,575; United Concrete Pipe Corp., Baldwin Park, $1,087,358. Contract awarded to Griffith Company, Los Angeles, $817,166.

LOS ANGELES COUNTY—On Hollywood Freeway in the City of Los Angeles between Hollywood Boulevard and Western Avenue, about 0.7 mile to be graded and surfaced with Portland cement concrete on cement treated subgrade. District VII, Route 2. J. E. Haddock, Ltd., Pasadena, $1,376,104; Bressi & Bevanda Constructors, Inc., North Hollywood, $1,476,937; United Concrete Pipe Corp., Baldwin Park, $1,496,967; Winston Bros. Co., Monrovia, $1,510,341; Bongiovanni Construction Co., Hollywood, $1,532,060; Griffith Company, Los Angeles, $1,583,463; C. G. Willis & Sons, Inc., Los Angeles, $1,602,490; Clyde W. Wood & Sons, Inc., North Hollywood, $1,612,666; A. Teichert & Son, Inc., Sacramento, $1,688,137; Guy F. Atkinson Co., Long Beach, $1,789,070. Contract awarded to Webb & White, Los Angeles, $1,370,545.30.

LOS ANGELES COUNTY—At the intersection of Figueroa Street with Sepulveda Boulevard and the intersection of Lakewood Boulevard with Gardendale Street, full traffic-actuated signal systems and highway lighting at two intersections to be furnished and installed. District VII, Routes 165,168, Sections A,A. Westates Electrical Construction Co., Los Angeles, $24,858; Electric & Machinery Service, Inc., South Gate, $26,413; C. D. Draucker, Inc., Los Angeles, $26,559. Contract awarded to Fischhach & Moore, Inc., Los Angeles, $24,581.

MERCED AND STANISLAUS COUNTIES—At intersections of Route 4 with El Capitan Way, Johnson Street and Golf Road, traffic signal system with highway lighting at one intersection and highway lighting at two intersections to be furnished and installed. District X, Route 4, Sections D,A. R. Coold & Son, Stockton, $22,371; Underground Electric Construction Co., Oakland, $24,242; Main Electric Service, Stockton, $24,947; Howard Electric Co., Gilroy, $26,424. Contract awarded to L. H. Leonardi Electric Construction Co., San Rafael, $21,750.

SAN BERNARDINO COUNTY—In the City of San Bernardino at the intersections of Fifth Street with F Street, G Street, and H Street, traffic signal systems and highway lighting to be furnished and installed. District VIII, Route 9. Electric & Machinery Service, Inc., South Gate, $11,265; Fischbach & Moore, Inc., Los Angeles, $12,422; Westates Electrical Construction Co., Los Angeles, $12,918; C. D. Draucker, Inc., Los Angeles, $13,210; Paul R. Gardner, Ontario, $14,436. Contract awarded to Trico Company, Burbank, $11,140.

SANTA CLARA COUNTY—At the intersections of Bayshore Highway with Moffett Boulevard and at Moffett Field South Gate, traffic signal system and highway lighting to be modified at one intersection, traffic signal system and highway lighting to be furnished and installed at one intersection, and channelization to be constructed. District IV, Route 68, Section A. R. Flatland, San Francisco, $42,596; Edward Keeble, San Jose, $44,472; John B. Paroline, Morgan Hill, $44,977; A. J. Raisch Paving Co., San Jose, $46,775; L. C. Smith Co., Building Products Inc., Con Car Ranch & Enterprises, Inc., San Mateo, $47,590; J. Henry Harris, Berkeley, $48,690; Bragato Paving Co., Belmont, $49,562; Peter Sorensen, Redwood City, $56,500. Contract awarded to J. C. Bateman, Inc., San Jose, $41,687.60.

SANTA CLARA COUNTY—On Eastshore Freeway between 0.9 mile north of Route 68 and 0.2 mile north of Trimble Road, about 1.8 miles to be graded and paved with Portland cement concrete and plant-mix surfacing and highway separation structures to be constructed. District IV, Route 69, Section A. Dan Caputo & Edward Keeble, San Jose, $1,278,630; Fredrickson Bros. & Lew Jones Construction Co., Emeryville, $1,310,988; Carl N. Swenson Co. Inc. & Ball and Simpson, Berkeley, $1,317,010; United Concrete Pipe Corp., Baldwin Park, $1,388,154; Guy F. Atkinson Co., South San Francisco, $1,413,033; Granite Construction Co., Watsonville, $1,418,001. Contract awarded to Fredrickson & Watson Construction Co. & M & K Corp., Oakland, $1,260,449.16.

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CONTRA COSTA COUNTY—Between Railroad Avenue in Pittsburg and A Street in Antioch, about five miles to be graded and paved with Portland cement concrete and plant-mixed surfacing and six grade separation structures to be constructed. District IV, Route 75. Ball and Simpson & H. Earl Parker, Inc., Berkeley, $2,527,742; Frederickson & Watson Construction Co. and M & K Corp., Oakland, $2,529,581; Eaton & Smith, San Francisco, $2,584,636; Guy F. Atkinson Co., South San Francisco, $2,590,657; A. Teichert & Son, Inc., Sacramento, $2,627,925; Parish Bros., Benicia, $2,681,210; Granite Construction Co., Watsonville, $2,708,374; United Concrete Pipe Corp., Baldwin Park, $2,718,949; Lord & Bishop and M. J. B. Construction Co., Sacramento, $2,743,741; Chas. L. Harney, Inc., San Francisco, $2,888,868. Contract awarded to Peter Kiewit Sons Co., Arcadia, $2,516,564.70.

KERN COUNTY—At the intersection of State Route 4 with Sherwood Avenue, Kern Avenue, and Perkins Avenue in McFarland, full traffic actuated signal system with highway lighting to he furnished and installed at one intersection and highway lighting to be furnished and installed at two intersections. District VI, Route 4, Section F. L. H. Leonardi Electric Construction Co., San Rafael, $23,691; Hall Sloat Electric Co., Inc., Oakland, $23,899; A-C Electric Co., Bakersfield, $24,619; Electric and Machinery Service, Inc., South Gate, $26,048; R. Gould & Son, Stockton, $26,508; R. Flatland, San Francisco, $26,650; C. D. Draucker, Inc., Los Angeles, $27,871; Fischbach & Moore, Inc., Los Angeles, $28,016. Contract awarded to Howard Electric Co., Gilroy, $23,581.

LASSEN COUNTY—Between 4.5 miles and 6.5 miles north of Secret Valley, about 2.1 miles to be graded and surfaced with road-mixed surfacing on untreated rock hase. District II, Route 73, Section D. Harms Bros., Sacramento, $329,640; O'Connor Bros., Red Bluff, $329,987; Eaton & Smith, San Francisco, $359,888; J. Henry Harris, Berkeley, $387,438; United Concrete Pipe Corp., Baldwin Park, $389,226. Contract awarded to A. Teichert & Son, Inc., Sacramento, $310,780.

LOS ANGELES COUNTY—On Hollywood Freeway, between Hollywood Boulevard and Western Avenue, highway lighting and illuminated sign systems to be furnished and installed. District VII, Route 2. C. D. Draucker, Inc., Los Angeles, $59,660; Electric & Machinery Service, Inc., South Gate, $61,037; Fischbach & Moore, Inc., Los Angeles, $62,852. Contract awarded to Westates Electrical Construction Co., Los Angeles, $58,891.

LOS ANGELES COUNTY—On Ramona Freeway between 0.1 mile east of Jackson Avenue and Rosemead Boulevard, about 1.7 miles to be graded and paved with Portland cement concrete on cement-treated subgrade and with plant-mixed surfacing on imported base material and six bridges to be constructed to provide a six-lane divided highway with frontage roads. District VII, Route 26, Section E. Vido Kovacevich Co., South Gate, $2,421,609; J. E. Haddock, Ltd., Pasadena, $2,422,648; Guy F. Atkinson Co., Long Beach, $2,439,070; United Concrete Pipe Corp., Baldwin Park, $2,445,295; A. Teichert & Son, Inc., Sacramento, $2,508,736; Bressi & Bevanda Constructors, Inc., North Hollywood, $2,654,627; Peter Kiewit Sons' Co., Arcadia, $2,663,233. Contract awarded to Griffith Co., Los Angeles, $2,307,503.40.

LOS ANGELES COUNTY—Over Ramona Freeway and tracks of the Pacific Electric Railway at Evergreen Avenue, a structural steel and reinforced concrete bridge for a pedestrian overcrossing to be constructed. District VII, Route 26. O. B. Pierson, Bellflower, $72,765; Byerts & Sons and Geo. K. Thatcher, Los Angeles, $79,584. Contract awarded to J. E. Haddock, Ltd., Pasadena, $72,047.75.

LOS ANGELES COUNTY—In the city of Monrovia, on Huntington Drive between Shamrock Avenue and Mountain Avenue, about 0.3 mile to be graded and surfaced with plant-mixed surfacing on untreated rock base and on the existing pavement and widening an existing reinforced concrete slab bridge across Sawpit Wash. District VII, Route 161. Vido Kovacevich Co., South Gate, $40,444; J. E. Haddock, Ltd., Pasadena, $41,531; Jesse S. Smith and Service Construction Co.. of Southern California, Burbank, $47,231; Dimmitt & Taylor, Monrovia, $48,532; Walter Kaucher, Los Angeles, $49,395; Stuckey & Carroll Construction Co., San Gabriel, $66,129. Contract awarded to Warren Southwest, Inc., Torrance, $39,028.76.

LOS ANGELES COUNTY—On Los Angeles River Freeway across Del Amo Boulevard and across Compton Creek about 0.2 mile west of the city limits of Long Beach, two reinforced concrete bridges to be constructed and approach embankments for the bridge across Compton Creek to be graded. District VII, Route 167, Section A. J. E. Haddock, Ltd., Pasadena, $531,011; K. B. Nicholas, Ontario, $537,519; Oberg & Cook, Gardena, $543,242; Guy F. Atkinson Co., Long Beach, $552,219; C. B. Tuttle Co., Long Beach, $559,841; Bongiovanni Construction Co., Los Angeles, $561,595; Byerts & Sons and Gco. K. Thatcher, Los Angeles, $574,456. Contract awarded to R. M. Price Co., Altadena, $508,656.

LOS ANGELES COUNTY—At the intersections of Lakewood Boulevard with Candlewood Street, Hardwick Street, and Del Amo Boulevard, traffic signal systems and highway lighting at three intersections to be furnished and installed. District VII, Route 168, Section A. Westates Electrical Construction Co., Los Angeles, $43,645; Electric & Machinery Service, Inc., South Gate, $45,118; C. D. Draucker, Inc., Los Angeles, $46,160. Contract awarded to Fischbach & Moore, Inc., Los Angeles, $43,274.

ORANGE COUNTY—On Laguna Canyon Road, between Forest Avenue in Laguna Beach and 0.2 mile north of Canyon Acres Drive, about 0.9 mile of roadway to be graded, untreated rock base to be placed and surfaced with plant-mixed surfacing. District VII, Route 185. Dimmitt & Taylor, Monrovia, $269,-114; Cox Bros. Consruction Co., Stanton, $282,073; Flickinger-Welker, Inc., Los Angeles, $286,280; E. C. Young, San Fernando, $292,332; Sully-Miller Contracting Co., Long Beach, $299,472; Clifford C. Bong & Co., Arcadia, $331,643; A. Teichert & Son, Inc., Sacramento, $333,021; Tomei Construction Co., Van Nuys, $371,663. Contract awarded to Nappe Construction Co., Inc., North Hollywood, $265,790.55.

ORANGE COUNTY—At the intersection of Newport Avenue with MacArthur Boulevard-Main Street in the City of Fullerton, at the intersection of Spadra Road with Brea Boulevard, and in the City of Anaheim at the intersection of Center Street with Olive Street, full traffic actuated signal systems with highway lighting at two intersections and fixed-time traffic signal system with modification to existing lighting at one intersection to be furnished and intsalled. District VII, Routes 43, 184, 2, 19, 178. Fischback & Moore, Inc., Los Angeles, $34,708; Westates Electrical Constructoin Co., Los Angeles, $35,073; C. D. Draucker, Inc., Los Angeles, $36,039. Contract awarded to Electric & Machinery Service, Inc., South Gate, $34,103.

SAN DIEGO COUNTY—Between 0.4 mile and 6.1 miles east of Julian, portions, about four miles in length to be graded and bituminous surface treatment applied. District XI, Route 198, Section E. Ralph B. Slaughter, Julian, $159,928; Clifford C. Bong & Co., Arcadia, $172,438; Einer Bros., Inc., Escondido, $178,594; Dimmitt & Taylor, Monrovia, $190,829; Ralph A. Bell, Monrovia, $212,812; L. S. Hawley, Montebello, $214,284; Walter H. Barber, La Mesa, $221,796; Cox Bros. Construction Co., Stanton, $342,366. Contract awarded to E. C. Young, San Fernando, $130,773.70.

SAN MATEO COUNTY—Between south city limits of San Francisco and 0.6 mile south, about 0.5 mile to be graded. District IV, Route 68, Section E. Piombo Construction Co., San Francisco, $172,320; Eaton & Smith, San Francisco, $227,634; United Concrete Pipe Corp., Baldwin Park, $229,160; Guy F. Atkinson Co., South San Francisco, $307,810; L. A. & R. S. Crow, El Monte, $301,300; C. G. Willis & Sons, Inc., Los Angeles, $242,732; Charles L. Harney, Inc., San Francisco, $254,180; L. C. Smith Co., San Mateo, $267,545; S. A. E. Co., Redwood City, $280,000; Ball & Simpson, Berkeley, $289,950; Charles J. Rounds, Los Angeles, $341,370; Frederickson & Watson Construction Co.-M & K Corp., Oakland, $350,000; Frederickson Bros., Emeryville, $360,460; H. Earl Parker, Inc., Marysville, $373,-600; C. V. Kenworthy, Stockton, $394,000. Contract awarded to Edward Keeble, San Jose, $136,260.

SOLANO COUNTY—In and adjacent to the City of Vallejo, at the intersection of State Route 7 with Magazine Street, full traffic-actuated signal system and highway lighting to be furnished and installed and channelization and drainage facilities to be constructed. District X, Route 7, Section F, Val. Parish Bros., Benicia, $21,363; J. Henry Harris, Berkeley, $22,664. Contract awarded to R. Flatland, San Francisco, $20,579.

SONOMA COUNTY—Installation of highway signals and lighting at intersections of Main Street with Santa Rosa Avenue-Bodega Avenue in City of Sebastopol and at junction of Redwood Highway with Gravenstein Highway near Cotati. District IV, Routes 1, 104, 51. R. Flatland, San Francisco, $12,-551; Arthur B. Siri, Inc., Santa Rosa, $12,665; Helwig Construction Co., Sebastopol, $12,923. Contract awarded to J. Henry Harris, Berkeley, $12,445.40.

SAN LUIS OBISPO COUNTY—In San Luis Obispo, between Marsh Street and Morro Street, about 0.5 miles, three reinforced concrete bridegs to be constructed and one existing bridge to be widened and roadways to be graded and paved with plant-mixed surfacing on cement treated base. District V, Route 2. C. K. Moseman, Redwood City, $428,963; Trewhitt, Shields & Fisher, Fresno, $430,792; Madonna Construction Co., San Luis Obispo, $433,910; Granite Construction Co., Watsonville, $438,177; Thomas Construction Co. and H. Earl Parker, Inc., Fresno, $454,369; J. E. Haddock, Ltd., Pasadena, $489,444. Contract awarded to C. B. Tuttle Co., Long Beach, $412,863.

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KERN COUNTY—On Allen Road and Santa Fe Way, between Rosedale Avenue and State Route 139, about 10.3 miles to be graded and surfaced with road-mixed surfacing and bituminous treated surfacing on imported base material cement treated. District VI, Routes 1161, 575. Rice Bros., Inc., Marysville, $354,712; Baun Construction Co., Fresno, $375,979; Volpa Bros., Fresno, $377,634; Griffith Co., Los Angeles, $386,600; Peter Kiewit Sons' Co., Arcadia, $388,044; M. J. B. Construction Co., Stockton, $389,-748; Oilfields Trucking Co. and Phoenix Construction Co., Inc., Bakersfield, $390,772; Dimmit & Taylor, Monrovia, $416,237; Granite Construction Co., Watsonville, $422,446; Ball & Simpson, Berkeley, $422,-692; Claude C. Wood Co., Lodi, $423,642; Dicco, Inc., Bakersfield, $433,099; Close Building Supply, Inc., Hayward, $433,685; Louis Biasotti & Son, Stockton, $433,737; Harms Bros., Sacramento, $460,-701; Clyde W. Wood & Son, Inc., North Hollywood, $493,575; Osborn Company, Pasadena, $557,491. Contract awarded to Maddona Construction Co., San Luis Obispo, $343,308.

LOS ANGELES COUNTY—On Hollywood Freeway in the City of Los Angeles, between Mulholland Drive and Cahuenga Boulevard and between Gower Street and Hollywood Boulevard, three bridges, one pedestrian undercrossing, extensions to two existing pedestrian undercrossings and 11 retaining walls to be constructed and about 1.4 miles to be graded and surfaced with Portland cement concrete pavement on cement treated subgrade to provide a six-lane divided highway. District VII, Route 2. A. Teichert & Son, Sacramento, $2,312,771; Bressi & Bevanda Constructors, Inc., North Hollywood, $2,317,836; R. J. Daum Construction Co. and Webb and White, George W. Peterson, Jack W. Baker, Los Angeles, $2,318,260; J. E. Haddock, Ltd., Pasadena, $2,335,498; Winston Brothers Co., Monrovia, $2,348,801; Guy F. Atkinson Co., Long Beach, $2,444,379. Contract awarded to Bongiovanni Construction Co., Los Angeles, $2,-274,366.30.

LOS ANGELES COUNTY—In the City of Los Angeles, at the intersections of Franklin Avenue with Vine Street and with Argyle Avenue, furnishing and installing highway lighting. District VII, Route 2. Ets-Hokin & Galvan, Inc., Wilmington, $3,752; Westates Electrical Construction Co., Los Angeles, $4,623; Electric and Machinery Service, Inc., South Gate, $4,896; Fischbach and Moore, Inc., Los Angeles, $5,132. Contract awarded to Ed. Seymour, Long Beach, $3,348.

LOS ANGELES COUNTY—On Hollywood Freeway between Mulholland Drive and Cahuenga Boulevard and between Gower Street and Hollywood Boulevard, highway lighting and illuminated sign systems to be furnished and installed and electroliers to be installed. District VII, Route 2. Fischbach & Moore, Inc., Los Angeles, $153,992; C. D. Draucker, Inc., Los Angeles, $156,056; Westates Electrical Construction Co., Los Angeles, $158,927. Contract awarded to Electric & Machinery Service, Inc., South Gate, $141,552.

SACRAMENTO COUNTY—Across the Sacramento River at Paintersville, one mile south of Courtland, a bridge to be repaired. District III, Route 11-E. James H. McFarland, San Francisco, $41,519; Lord & Bishop, Sacramento, $42,665; B. S. McElderry, Berkeley, $46,485; R. E. Hertel, Sacramento, $49,592; R. G. Clifford and C. O. Bodenhamer, Berkeley, $57,-274; George Pollock, Sacramento, $69,200. Contract awarded to Barton Construction Company, Oakland, $39,930.52.

SAN DIEGO COUNTY—Between Palm Avenue in Palm City and G Street in Chula Vista, full traffic actuated signal system with highway lighting at one intersection, and highway lighting at five intersections to be furnished and installed. District XI, Route 2-G, Ch. V. California Electric Works, San Diego, $43,751. Contract awarded to Ets.-Hokin & Galvan, San Diego, $42,321.

SAN DIEGO COUNTY—At the intersection of Pacific Highway with Miramar Road, in the City of San Diego, full traffic actuated signal system and highway lighting to be furnished and installed and channelization to be constructed. District XI, Route 2-S.D. R. E. Hazard Contracting Company, San Diego, $41,-984; Daley Corporation, San Diego, $46,357; V. R. Dennis Construction Company, San Diego, $47,026; Griffith Company, Los Angeles, $47,712. Contract awarded to Cox Bros. Construction Company, Stanton, $41,576.80.

SAN DIEGO COUNTY—Between Oceanside and Bonsall, portions about five miles in net length to be graded and surfaced with road-mixed surfacing. District XI, Route 195-A.F. Slaughter & Young, Julian, $199,673; Einer Bros. Inc., Escondido, $204,207; Sharp and Fellow Contracting Company, Los Angeles, $205,386; George Herz and Company, San Bernardino, $209,449; Cox Bros. Construction Company, Stanton, $227,113; Clifford C. Bong and Company, Arcadia, $228,115; R. A. Erwin, Colton, $241,930; Osborn Company, Pasadena, $253,929; Dimmitt and Taylor, Monrovia, $259,707. Contract awarded to C. G. Willis and Sons, Inc., Los Angeles, $197,923.55.

SAN DIEGO COUNTY—Portions between Seventh Street in National City and 32d Street in San Diego, about eight-tenths mile in net length, 36-inch chain link fence and median lanes to be constructed. District XI, Route 2-Nat. C.S.D. United States Steel Company, Cyclone Fence Department, San Diego, $6,460; Atlas Iron and Wire Works, San Diego, $6,783. Contract awarded to Pacific Fence Company, Los Angeles, $6,439.80.

SAN FRANCISCO COUNTY—On 13th Street between Mission Street and Route 68, the fouodations for a portion of a bridge and miscellaneous road work to be constructed. District IV, Route 2-SF. Piombo Construction Company, San Francisco, $464,101; Healy-Tibbitts Construction Company, San Francisco, $493,046; Eaton and Smith, San Francisco, $501,500; Fredrickson and Watson Construction Company, M and K Corporation, Oakland, $540,327; Guy F. Atkinson Company, South San Francisco, $545,332; Duncanson-Harrelson Company, Richmond, $595,941. Contract awarded to Charles L. Harney, Inc., San Francisco, $458,072.35.

SAN JOAQUIN COUNTY—Furnishing and installing lavatory building and fixtures at District X Office, Stockton, District X. Craft Mill and Supply Company, Stockton, $2,170; E. R. Stark, Stockton, $2,249; Nomellini Construction Company, Stockton, $2,480; Shepherd & Green, Stockton, $2,621; V. A. Nelson, Stockton, $3,286. Contract awarded to Don Clark, Inc., Stockton, $2,119.

SAN MATEO—Portola Road and Alpine Road, about three miles south of Woodside, about four miles in length, to be graded and imported subbase material to be placed. District IV, Route 1048. Edward Keeble, San Jose, $99,762; M. J. Ruddy & Son, Modesto, $109,617; Cecil L. Moore, San Leandro, $114,498; Eaton and Smith, San Francisco, $115,586; Granite Construction Company, Watsonville, $118,714; M. Malfitano & Son, Inc., Pittsburg, $128,202; L. C. Smith Company, San Mateo, $131,851; S. A. E. Co., Redwood City, $134,015; Huntington Bros., Napa, $141,493; Fredrickson Bros., Emeryville, $149,753. Contract awarded to John Delphia, Patterson, $97,-419.30.

ALAMEDA COUNTY—At and adjacent to the intersection of Hesperian Boulevard with Lewelling Boulevard, traffic signal system and highway lighting to be furnished and installed, plant-mixed surfacing to be placed on existing roadway and curbed islands to be constructed. District IV, Routes 69 and 228, Sections B,A. O. C. Jones & Sons, Berkeley, $15,078; Frank Electric Co., Hayward, $15,541; Manning & Whitaker, Inc., San Francisco, $15,771; R. Gould & Son, Stockton, $15,883; R. Flatland, San Francisco, $16,004; J. Henry Harris, Berkeley, $16,062. Contract awarded to Underground Electric Construction Co., Oakland, $14,923.50.

LOS ANGELES COUNTY—On Santa Ana Freeway, between Los Angeles Street and Lyon Street, a combination railroad underpass and highway separation structure, a railroad underpass, a pumphouse, a drainage storage box, reinforced concrete retaining

walls to be constructed and approximately 0.34 mile to be graded and portions to be surfaced with Portland cement concrete pavement on cement treated subgrade and asphalt concrete on imported base material; acceleration and deceleration lanes, frontage roads and streets to be surfaced with plant-mixed surfacing on imported base material; to provide a freeway with six-lane divided roadbed. District VII, Route 2. W. J. Disteli, Los Angeles, $1,290,209; Guy F. Atkinson Co., Long Beach, $1,307,721; Bressi & Bevanda Constructors, Inc., North Hollywood, $1,324,199; Webb & White, Los Angeles, $1,333,333; Vido Kovacevich Co., South Gate, $1,336,586; J. E. Haddock, Ltd., Pasadena, $1,337,419; MacDonald and Kruse, Sun Valley, $1,446,961. Contract awarded to George W. Peterson and Jack W. Baker, Los Angeles, $1,222,895.

LOS ANGELES COUNTY—On Hollywood Freeway between Mulholland Drive and Cahuenga Boulevard and between Gower Street and Hollywood Boulevard, highway lighting and illuminated sign systems to be furnished and installed and electroliers to be installed. District VII, Route 2. Fischbach & Moore, Inc., Los Angeles, $153,992; C. D. Draucker, Inc., Los Angeles, $156,056; Westates Electrical Construction Co., Los Angeles, $158,927. Contract awarded to Electric & Machinery Service, Inc., South Gate, $141,552.

NAPA COUNTY—Across Napa River on Lincoln Avenue in Calistoga, a reinforced concrete bridge and approaches to be widened. District IV, Route 49. D. M. Sandling, San Pablo, $64,896; R. G. Clifford & C. O. Bodenhamer, Berkeley, $67,938; Ted Schwartz, Grass Valley, $68,890; Bos Construction Co., Oakland, $69,864; Chas. S. Moore and Robert R. Murdoch, Oakland, $70,549; Stanley H. Koller Construction, Crockett, $72,937; Al Erickson & Co., Napa, $73,301; Pike & Hill, Corey Bros. & Bailey, San Rafael, $81,608; James H. McFarland, San Francisco, $90,816; R. E. Hertel, Sacramento, $96,857; Tumblin Co., Bakersfield, $102,699; H. H. Anderson and John B. Paroline, San Leandro, $1,552,722. Contract awarded to E. H. Peterson & Son, San Pablo, $62,813.

PLACER COUNTY—Between 1.7 miles and 2.3 miles north of Auburn, about 0.3 mile of roadbed to be widened, imported subbase material, untreated rock base and plant-mixed surfacing to be placed. District III, Route 17, Section C. M. J. Ruddy & Son, Modesto, $22,096. Contract awarded to Joe Chevreaux, Auburn, $18,246.

RIVERSIDE COUNTY—At the intersection of Mission Boulevard with Bloomington Boulevard-Nakoma Avenue, traffic signal system and highway lighting to be furnished and installed and channelization to be constructed. District VIII, Route 19, Section A. Fischbach & Moore, Inc., Los Angeles, $17,803; Electric and Machinery Service, Inc., South Gate, $18,430; Westates Electrical Construction Co., Los Angeles, $18,983. Contract awarded to Paul R. Gardner, Ontario, $16,642.35.

SACRAMENTO COUNTY—At the intersection of North Sacramento Freeway with El Camino Avenue, for constructing storage building and chain link fence. District III, Route 3, Section B. Sutter Supply Co., Sacramento, $4,774; Lawrence Construction Co., Sacramento, $4,941; "B" and "B" Construction Co., Sacramento, $4,999; Robert Bardell, Oakland, $5,557; Affiliated Engineering Contractors, Inc., Sacramento, $5,740. Contract awarded to Taylor and Mullen, North Sacramento, $4,525.

SAN BERNARDINO COUNTY—On Highland Avenue at Del Rosa Channel, a reinforced concrete box culvert to be constructed. District VIII, Route 190, Section C. Morgan-Weiser, Inglewood, $12,437; Matich Brothers and Matich Brothers Paving Co., Colton, $13,102; A. A. Edmondson, San Fernando, $13,463; Thomas Construction Co., Fresno, $14,667; O. B. Pierson, Bellflower, $15,090; N. M. Saliba Co., Los Angeles, $17,775; E. L. Yeager Co., Riverside, $18,923. Contract awarded to George Herz and Co., San Bernardino, $12,177.

SAN FRANCISCO CITY AND COUNTY—Between Army Street and 17th Street about 1.3 miles to be graded and paved with Portland cement concrete on cement treated subgrade and plant-mixed surfacing on cement treated base; a grade separation structure and three pedestrian overcrossings to be constructed and highway lighting and traffic signals to be furnished and installed. District IV, Route 68. Chas. L. Harney, Inc., San Francisco, $1,394,870; Ball & Simpson, Berkeley, $1,431,203; Judson Pacific-Murphy Corp., Emeryville, $1,472,042; Eaton & Smith, San Francisco, $1,577,262. Contract awarded to Fredrickson & Watson Construction Co., M & K Corp., Oakland, $1,386,336.12.

SAN DIEGO COUNTY—At intersections of El Cajon Blvd. with Oregon Street, Euclid Avenue, 54th Street and 70th Street, in San Diego, pedestrian signals to be furnished and installed. District XI, Route 12. California Electric Works, San Diego, $3,098. Contract awarded to Ets-Hokin & Galvan, San Diego, $2,891.

SAN DIEGO COUNTY—Between Oceanside and Bonsall, portions, about 5 miles in net length, to be graded and surfaced with road-mixed surfacing. District XI, Route 195, Sections A,F. Slaughter & Young, Julian, $199,673; Einer Bros., Inc., Escondido, $204,207; Sharp & Fellow Contracting Co., Los Angeles, $205,386; George Herz & Co., San Bernardino, $209,449; Cox Bros. Construction Co., Stanton, $227,113; Clifford C. Bong & Co., Arcadia, $228,115; R. A. Erwin, Colton, $241,930; Osborn Company, Pasadena, $253,929; Dimmitt & Taylor, Monrovia, $259,707. Contract awarded to C. G. Willis & Sons, Inc., Los Angeles, $197,923.55.

SONOMA COUNTY—Between ¼ mile west of Monte Rio and Northwood (portions), a net length of 0.8 mile, to be graded and surfaced with plant-mixed surfacing on imported base material. District IV, Route 104, Section A. Arthur B. Siri, Inc., Santa Rosa, $88,504; Huntington Bros., Napa, $94,335; J. Henry Harris, Berkeley, $135,680. Contract awarded to Eaton and Smith, San Francisco, $79,487.10.

SUTTER COUNTY—At 13 locations between one mile east of Meridian and 3 miles west of Yuba City, culverts and drainage structures to be extended and roadway to be widened. District III, Route 15, Sections A,B. Laredon Construction Co., Los Angeles, $18,688; Rice Brothers, Inc., Marysville, $18,984; Charles S. Moore & Robert R. Murdoch, Oakland, $19,303; Ted Schwartz, Grass Valley, $24,264; O'Connor Bros., Red Bluff, $26,156; H. Earl Parker, Inc., Marysville, $37,234. Contract awarded to Commercial Construction Co., Marysville, $16,075.50.

VENTURA COUNTY—At the intersection of Ventura Boulevard with Saviers Road-Vineyard Avenue, traffic signal system and highway lighting to be furnished and installed. District VII, Routes 2,154; Sections, C,A. Fischbach & Moore, Inc., Los Angeles, $12,328; Electric Machinery Service, Inc., South Gate, $12,569; Westates Electrical Construction Co., Los Angeles, $12,771. Contract awarded to C. D. Draucker, Inc., Los Angeles, $11,996.

VENTURA COUNTY—Between Oxnard Boulevard and east city limits of Oxnard, about 0.6 mile to be graded and surfaced with plant-mixed surfacing on untreated rock base. District VII, Route 153. C. W. Peterson, North Hollywood, $80,117; Griffith Company, Los Angeles, $81,350. Contract awarded to Baker & Pollock, Ventura, $74,197.70.

F. A. S. County Routes

TULARE COUNTY—On Poplar Road, between 6 miles south of Poplar and Poplar, about 6 miles to be graded and surfaced with road-mixed surfacing on cement treated base. District VI, FAS Route 1130. Valley Paving & Construction Co., Inc., Pismo Beach, $166,947; Volpa Bros., Fresno, $167,935; Rice Bros., Inc., Marysville, $168,024; M. J. B. Construction Co., Stockton, $170,656; Oilfields Trucking Co. and Phoenix Construction Co., Inc., Bakersfield, $179,590; Flickinger-Welker, Inc., Los Angeles, $176,186; Griffith Co., Los Angeles, $183,307; Close Building Supply, Inc., Hayward, $186,650; Thomas Construction Co., Fresno, $194,159; United Concrete Pipe Corp., Baldwin Park, $198,610; Claude C. Wood Co., Lodi, $204,461; M. J. Ruddy & Son, Modesto, $213,156; W. H. O'Hair Co., Colusa, $222,210; Dicco, Inc., Bakersfield, $223,568. Contract awarded to Baun Construction Co., Fresno, $161,302.

Antiskid

Continued from page 36 . . .

directed into a long rectangular metal hood mounted on broad steel runners. This hood is towed behind the flame generator and serves to concentrate the heat on the pavement surface.

Design of Drag

The metal scratch drag, which is towed behind the hood, is constructed in two sections, each containing two rows of 80-penny spikes. Holes on three-inch centers in the base plate of each section serve to space the spikes. The holes of one line are staggered with respect to those of the other line in order to give an effective spacing of 1½ inches. The spikes are held in a vertical position by two angle irons bolted together between the spikes. The leg of one angle is welded to the base plate. Spikes are set to protrude about one inch below the base place and can be driven down as necessary to compensate for wear. During the past year, in order to more thoroughly scratch distorted areas of surfacing on some of the work, the front section of the drag has been divided into two units and the rear section divided into three or more units. These units are held together by chains and extra weight is added if needed.

The surface treatment, like discing, is most effective if undertaken after the weather has cooled to the extent that excess asphalt will not again be flushed to the surface of the seal coat. The rough texture thus developed will generally remain until the following summer.

The hood and drag as first constructed in District II had an effective width of five feet. Similar equipment made up in District III for work during the fall of 1951 was about seven feet wide.

Cost of treatment has ranged from about $300 to $500 per mile of two-lane pavement.

The State Division of Highways uses two-way FM radio in directing its snow removal operations and keeping motorists informed of winter road conditions.

Highway Problems

Continued from page 43 . . .

challenge. John Doe will not have begun to understand how his highways are built and maintained until he understands something about a financing structure which is anything but simple. He must be told in plain but accurate terms where highway money comes from and how it is distributed.

In the same terms, he must be told about its inadequacy. We have a statewide highway deficiency which is estimated at 3 billion dollars in terms of today's traffic and today's construction costs.

Financial Problem

Although it is not within the province of the Highway Commission to say how much money should be provided for highways or in what manner the funds should be raised, it is certainly a duty of the commission, and other highway officials, to inform the public that the demands and needs of highway users cannot be met with the funds presently available. Any actual move toward changing the extent or methods of highway financing is a matter for determination by the people and the Legislature, after they are satisfied that the most effective use of available moneys is now being made.

The highway committees of the local chambers of commerce and the State Chamber of Commerce have been very effective and helpful in determining traffic needs and at the same time obtaining thorough public discussion of controversial issues. I know I speak for the entire Highway Commission in expressing our appreciation for the yeoman service performed by the chamber of commerce at both the state and local level not only in interpreting local conditions and situations to the commission, but also in interpreting highway problems to the people of their communities.

The least that the engineer and highway official can do for such committees is to give them the benefit of their knowledge and experience. They can make technical data available for committee study, preferably in not overly technical form. In advance of committee sessions they can prepare maps and sketches which will bring the situation to life and make explanations easier.

The same principles of public relations apply to city and county street and road problems as to state highways. The basic solution lies in increased public understanding. This understanding depends on an intelligent public interest, and the maintaining of public interest depends on leadership. While the Highway Commission and highway engineers are not the appropriate persons to supply that particular leadership, we can and should equip the leaders with whatever special knowledge we have acquired through experience. The problem of remedying our highway deficiencies is so acute that we cannot lay claim to doing our assigned job if we fail to do everything reasonable to supply the public with the available facts.

In Memoriam

KYLE TRUESDALE

Kyle Truesdale, 51, Maintenance Leading Man with 27 years of service in the Division of Highways, died on March 20th from injuries received when he was struck down by a car.

The accident, which took place on March 11th, happened while he was engaged in highway repair work about 17 miles west of Santa Barbara on U. S. 101.

Mr. Truesdale was born June 16, 1900, in Shandon and received his schooling there. He began his career with District V of the Division of Highways in 1924, serving in the Monterey, San Luis Obispo and Santa Barbara areas. For the past 16 years he has lived in Santa Barbara.

Mr. Truesdale was past president of Santa Barbara Chapter 25, California State Employees Association, of which he was a charter member. He was also a member of the Magnolia Lodge No. 242, F. and A. M., and of the Royal Arch Masons and the Knights Templar.

He is survived by his widow, Beatrice; his mother, Mrs. Hollis Truesdale; a sister, Mrs. Edna Gibson; and three brothers, Ralph, Everett and Hugh.

In Memoriam

RAY E. RALEY

Assistant Highway Engineer Ray E. Raley died at his home in San Bernardino on February 14, 1952, following a brief illness. He had many friends in and out of state service, since his 29 years with the Division of Highways had included assignments in many different areas of California.

Mr. Raley was born in Hanoverton, Ohio, June 28, 1890. He went to work for the State of Oregon in 1917 as a rodman on highway location, and moved to California in 1922 as a draftsman in the District V office in San Luis Obispo. After working in several different districts and on the San Francisco - Oakland Bay Bridge, Mr. Raley was transferred to District VIII in February, 1948. He was in the design department of that district at the time of his death.

He was educated at Mount Union College and at Carnegie Institute of Technology and later pursued engineering studies in California universities. He was a registered civil engineer, and was particularly active in Masonic circles. For three years he served as secretary of the 49ers Chapter of the Western Mining Council.

Mr. Raley is survived by his widow, Alice; by a son, Ray E. Raley, Jr., of Bakersfield; and by five brothers and two grandchildren.

In Memoriam

PAUL F. FRATESSA

Many friends of Paul F. Fratessa in the Department of Public Works are mourning his passing in San Francisco on March 4th, last.

From March 1, 1923, to February 28, 1927, Mr. Fratessa was attorney for the California Highway Commission. He served in that capacity during the administration of Governor Friend W. Richardson.

An outstanding member of the bar in San Francisco, Mr. Fratessa is remembered in Sacramento for his interest in highway matters and the zeal he displayed while in state service.

EARL WARREN
Governor of California

•

FRANK B. DURKEE
Director of Public Works

•

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U. S. 395

Improvement of This Important Route Keeping Pace With Growth

By S. W. LOWDEN, District Engineer

THE TREMENDOUS growth in population and importance of Southern California in recent years has been reflected in the development of the highways which serve it. Although a major share of attention has logically been focused on the metropolitan freeway system in Los Angeles and the freeways in and near San Diego, highway development in the inland section of Southern California has been keeping pace with improvements elsewhere to a greater extent than many people realize.

A glance at any map showing concentrations of industry and commerce in Southern California will draw attention to a great right triangle, with its hypotenuse (U. S. 101) running between San Diego and Los Angeles and its right angle at San Bernardino-Riverside.

Development of U. S. 395, the major north-south route serving the east side of this triangle, has been progressing for a number of years.

Starts in San Diego

Beginning at U. S. 101 in San Diego, U. S. Highway 395 heads inland by way of Escondido, to enter Riverside County and District VIII near Temecula.

Through Riverside County the existing route passes the town of Temecula, follows along the historic old Butterfield stage trail to Elsinore, and then crosses over the hills to Perris, March Air Force Base, and the City of Riverside. At Riverside, U. S. Highway 395 joins U. S. Highway 91 into San Bernardino County and the City of San Bernardino, where the two take up with U. S. Highway 66 to cross the Cajon Pass together. Across the pass, U. S. Highway 395 takes off alone over the Mojave Desert and enters Kern County and District IX near Johannesburg.

Through Kern, Inyo, and Mono Counties, the highway follows the easterly slope of the Sierra Nevada for some 300 miles, crosses into Nevada for 70 miles to pass through Carson City and Reno, and then re-enters California for another 200 miles along the easterly slope of the Sierra and Cascade Range to the Oregon line.

California Again Wins Traffic Safety Award

For the fourth time during his tenure of office, Governor Earl Warren has been presented the award of the Institute of Traffic Engineers for outstanding achievement in traffic engineering.

The Governor received the following telegram from M. W. Todd, executive secretary of the institute:

"Judges of National Traffic Safety Contest, for the second consecutive year, have voted a duplicate first place award to your State with Michigan for outstanding achievement in traffic engineering for group 5 states in 1951. Our heartiest congratulations to you and your officials."

California is in the group of states which includes the most thickly populated and heavily trafficked states: New York, Pennsylvania, Ohio, Illinois, Michigan, Indiana, Texas, and California.

Initial Improvement Wartime Project

Modernization of U. S. Highway 395 in District VIII began early in the second World War, even though at that time practically all highway construction was virtually at a standstill, deferred by the Federal Government in favor of more essential war production. The explanation is that the two-lane section of highway from Riverside to March Field and Camp Haan (since combined and now known as March Air Force Base) was entirely inadequate for the intensive military traffic which developed. So in just a few short months in 1942, with a high priority from the War Production Board because of the strategic importance of the work to the defense effort, the 10-mile section was converted to a four-lane divided highway. As it did for many military access roads during the war, the Division of Highways acted as agent for the Federal Government in designing the work, awarding the contracts, and supervising construction. Cost of construction totaled some $1,150,000, including a grade separation at the junction with U. S. Highway 60.

Temecula Unit

It was not until almost two years after the war that construction of the next unit of U. S. Highway 395 was undertaken in District VIII. This was the six-mile section between San Diego county line and one mile north of Temecula, which was awarded to contract in June, 1948. The winding old road over the Santa Rosa Mountains was abandoned in favor of a completely new expressway with partial control of access, still two lanes in width except for one short four-lane section, but on vastly superior alignment and grades suitable for modern-day traffic volumes and speeds. Inability to attain minimum design passing sight distance at one particularly rugged stretch was the reason for constructing the short piece of divided highway.

This, incidentally, was one of the early instances in California of a new freeway skirting the main street of a town. The beneficial effect upon the little town of Temecula has served as an example and guide to engineers and local businessmen in the treatment of subsequent similar freeway problems.

This unit was completed in 1949 at a cost of approximately $780,000.



Upper—One of two 90 degree turns on U. S. 395 and Adelanto, typical of deficiencies in the Mojave Desert portion of U. S. 395. Lower—Junction of old and new U. S. 395 one mile north of Temecula, looking northerly along the Temecula-Antelope road unit recently completed.

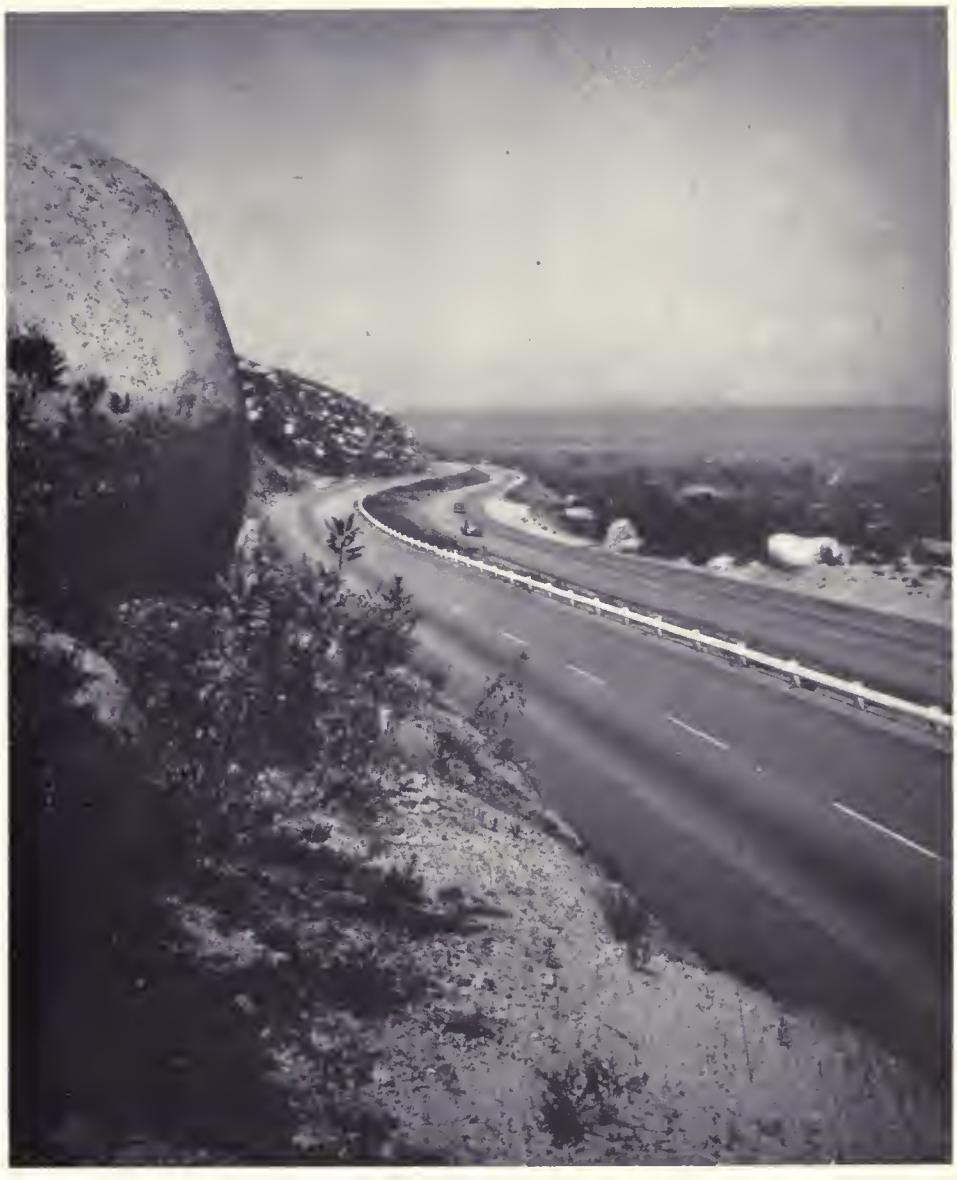
La Cadena Freeway

The next most critically deficient section on U. S. Highway 395 in Riverside County lay between the City of Riverside and the San Bernardino county line along the section known locally as La Cadena Drive, which then was a two-lane highway. In May, 1949, the 2.6-mile section between Russell Street and the county line was awarded to contract.

This is the only section of U. S. Highway 395 so far developed with full control of access. The freeway consists of a four-lane divided section, with the median divider wide enough for future development to six-lanes divided when warranted by traffic. Frontage roads parallel the freeway throughout its length; the one on the west side was the old highway. Although not yet a freeway in the full sense of the word, since there are several road crossings at grade, it is proposed to construct grade separations at these locations at some future date when funds become available.

This section of U. S. Highway 395 is also designed to fit into the plan for the ultimate freeway location through Riverside, Colton, and San Bernardino, studies for which are now underway.

The La Cadena unit of U. S. Highway 395 was completed in June, 1950, at a cost of $550,000. It presently carries about 11,000 vehicles per day.



Short section of divided highway on U. S. 395 between the San Diego County line and Temecula.

Temecula-Perris Cutoff

Following the development of U. S. Highway 395 in chronological order, it is necessary now to return to Temecula, where in November, 1950, the first contract was awarded for reconstructing U. S. Highway 395 on entirely new alignment between Temecula and Perris.

Reference to a map will reveal the old dogleg route followed by U. S. Highway 395 up the Temecula Valley through Murrieta, Wildomar, Sedco, and Elsinore, and then northeasterly across the hills to Perris. The new route, adopted after thorough study, takes off a mile north of Temecula in a northerly direction on entirely new alignment through the Antelope and Menifee Valleys, crosses State Sign Route 74 near Romoland and then, turning northwesterly, skirts the business section of Perris to connect with the present highway. The total distance is just 22 miles as compared to 30 miles via the old route.

Present traffic justifies only a two-lane highway on this stretch of U. S. Highway 395, and current construction is on that basis. The design and right of way, however, provide for ultimate development to four lanes divided, with partial control of access.

The cutoff is being constructed in three units. The first, from one mile north of Temecula to Antelope Road, seven miles in length, was completed in April, 1952, at a cost of $725,000. The second unit, 10.5 miles in length, from Antelope Road to Route 64 (State Sign Route 74) is currently underway. The contract was awarded in September, 1951, and work is expected to be completed in September, 1952. The estimated cost of construction is $800,000. The third unit, 4.7 miles in length, from Route 64 to Nuevo Road, is expected to get underway this summer. Plans are completed, the right of way has been acquired and $850,000 has been budgeted for its construction, including major struc-



Upper—La Cadena freeway section of U. S. 395 between Riverside and Colton, constructed in 1950. Lower—Blasting the big cut on the unit of U. S. 395 currently under construction between Antelope Road and State Sign Route 74.

tures across the San Jacinto River and grade separations at the connections to the City of Perris.

Perris-March Air Force Base Unit

The next section to the north, from Nuevo Road to the beginning of the divided highway at March Air Force Base, is proposed for development to a four-lane divided highway, utilizing the existing two-lane road for southbound traffic. Plans have been completed and right of way has already been acquired with partial control of access. Start of construction is dependent on availability of future highway funds.

Cajon Pass

In San Bernardino County, construction is now underway on U. S. Highway 395 in Cajon Pass. This is the $2,118,000 contract in which the southerly 9.3 miles of the pass between Devore and Gish Underpass are being developed from a two-lane highway to four lanes divided with partial control of access.

It was just 20 years ago that this stretch of highway was reconstructed to modern two-lane standards. Two lanes were adequate for traffic in the 1930's, but not today. In addition to U. S. Highway 395 traffic, the pass also serves two major transcontinental routes, U. S. Highways 66 and 91, and the average daily traffic has passed the 5,000 mark and is steadily increasing. Grades are steel and the percentage of truck traffic is high, which aggravates the congestion and intensifies the accident hazards, particularly in the upper regions where curves predominate, and fog, rain, ice and snow are common. It is not apparent because of the high desert plateau, but the highway attains an elevation of 4,300 feet at the summit of the pass.

Although 20 years old, the present road is for the most part adequate for retention as one-half of the divided highway, and the project has been designed accordingly except where other considerations require construction to higher grades. One such instance is in the vicinity of Cleghorn Creek where the debris cone has risen since 1932 to such an extent that a higher grade line is necessary.



Joshua trees, native to the higher desert regions traversed by U. S. 395, north of Cajon Pass, San Bernardino County.

Approximately 900,000 yards of earthwork will be excavated in the course of construction of this unit. The contract is expected to be completed in March, 1953.

The Cajon Pass contract now underway falls 3½ miles short of the summit, but it is planned to continue the four-lane divided expressway development over the summit and beyond as funds become available. Plans have been prepared and the right of way acquired for the next unit, from Gish Underpass to 1.4 miles north of Cajon Summit; and the third unit, from 1.4 miles north of Cajon Summit to junction of U. S. Highway 395 and U. S. Highway 66-91, is on the drafting tables.

Mojave Desert Projects

Through the Mojave Desert, U. S. Highway 395 is typical of early desert road construction. The roadbed is fairly good but narrow; grades follow



Upper—Construction at Cleghorn Creek on the Cajon Pass contract now under way. Plans call for reconstruction of the lower bridge to the same height as the upper, made necessary by rise in the debris cone during the 20 years since its construction. Lower—Construction operations on the Cajon Pass contract. The plant for base and surfacing materials appears in the left background.

undulations of the natural ground, necessitating numerous no-passing sections; shallow dips serve in lieu of culverts and bridges; long stretches of comparatively straight road are punctuated by occasional sharp curves.

Such conditions have no place on a modern highway system, but north of the junction with U. S. Highway 66-91 traffic on U. S. Highway 395 falls off to approximately 1,300 vehicles per day to Adelanto, and to approximately 500 north of Adelanto. With present financial limitations extensive development northerly is, therefore, probably some years in the future.

Freeway studies have been underway for several months in the two urban areas of Riverside and San Bernardino, and the future development of U. S. Highway 395 in those areas hinges upon ultimate over-all plans to be adopted by the California Highway Commission.

Eastshore Freeway

Opening of Project to San Lorenzo Cause for Celebration

By JOHN F. O'BRIEN, Resident Engineer

On JUNE 13, 1952, the third unit of the Eastshore Freeway will be opened to the traveling public. This 4.2-mile section of high-standard roadway will provide relief for one of the most congested areas in District IV and will mark the completion of approximately 11 miles of the planned facility between Oakland and San Jose.

This project will extend the portion of the Eastshore Freeway, being used by public traffic, southerly from its present terminus at 98th Avenue, Oakland, to a connection with Lewelling Boulevard near San Lorenzo.

It is located entirely on new alignment and passes through rapidly expanding residential developments, potential industrial and subdivision sites, and rich farm land, in and adjacent to the City of San Leandro.

It will replace an outmoded two-lane section of the existing State Highway Route 69.

Another Going Contract

Another contract is currently under way between Lewelling Boulevard and Jackson Street (State Route 105), scheduled for completion in mid-1953, which will extend southerly the Eastshore Freeway available for public traffic another 3.9 miles to a point near Mt. Eden, just west of Hayward.

Simultaneously, construction on Road SCl-69-A, now under way, is beginning to close the gap from San Jose toward Warm Springs. Lack of funds will, however, compel postponement of construction of the final link between Mt. Eden and Warm Springs for some time to come.

The Eastshore Freeway along the easterly shores of San Francisco Bay is located on level terrain. This section's alignment is tangent, except for a 6,000-foot radius curve at Williams Street and a 10,000-foot radius curve in the vicinity of San Leandro Creek.

Grades vary from a maximum of 3.25 percent to a minimum of 0.20 percent. Vertical curves provide 60 m.p.h. nonpassing sight distance.

Separation Structures

Six separation structures are included in the three interchanges and one overcrossing of this contract. All the bridges are steel beam type.

Following the stationing northwesterly, first access to the freeway is at ramps to Lewelling Boulevard.

Next is the unusual layout of the Washington Avenue interchange. Here design was complicated by the terminus of proposed Freeway Route 228 and the acute skew angle of Route 69 with Washington Avenue.

The largest of the three separation structures is a four-lane divided seven-span bridge carrying Washington Avenue traffic over the freeway and exchange roads.

Probably the most unique structure is the one that carries Route 69 over eastbound traffic of Route 228 (U. S. Route 50) destined for Livermore, Tracy and valley points. This bridge features long curved abutments with 36-inch steel girders and two all-welded plate girders. The longest of the plate girders has a 100-foot span. It is one of the largest ever fabricated on the West Coast. The top flange of this girder is encased in the curb, and through composite action utilizes the concrete for compression in carrying live load. For further reference see article by R. H. Kipp in the March-April, 1952, issue of *California Highways and Public Works* magazine.

Westbound traffic on Route 228 will pass under a Route 69 off-ramp structure.

First Avenue Interchange

Continuing northward there is the First Avenue (West Avenue 132d Street) interchange, which is planned as a future full four-quadrant cloverleaf interchange. Under this contract only half of the proposed overcrossing, a two-lane, six-span structure, was built. Construction of an additional bridge and the two undeveloped quadrants is proposed for a later date.

At Williams Street (West Avenue 129th Street) the freeway was depressed to provide clearance under the existing cross street at grade. Here water was encountered in the cut and an additional foot of base material was placed on a layer of pervious subbase material. Ground water drains through this pervious layer to a storage box or sump, is pumped to a culvert parallel to the freeway, then flows to an existing storm sewer on Davis Street. In addition, rock drains were installed at the toe of the cut along both sides of the roadway.

There is no access to the freeway at Williams Street. The separation structure is four spans in length, and it and the First Avenue structure are of continuous steel girder design. Each girder was shipped to the job in three pieces and butt-welded in the field.

Four-quadrant Cloverleaf

Last in this series of structures on this contract is at Davis Street, State Route 226, where a modified four-quadrant cloverleaf interchange was constructed within tight right of way. The four-lane divided seven-span structure is similar to the Washington Avenue separation, and carries Davis Street traffic over the freeway and collector roads.

At the extreme north end of the project, twin structures, 1,410 feet long and 28 feet wide between curbs, carry the freeway over San Leandro Creek, a City of Oakland drainage channel, and a single-track branch line of the Southern Pacific Railroad. These bridges were built under a separate contract let about two and a half years ago to C. B. Tuttle Co. of Long Beach, and were near completion at the time the general contract work started.

Professor Linn, of the School of Engineering, University of California, is engaged in a research program on one of the San Leandro Creek bridges.

During construction several hundred electrical strain gauges were attached to the structure, and some electric deflection gauges were placed on each girder.

The experiment is especially intended to determine two relationships: first, composite action between structural steel and concrete deck resulting from bond; second, transverse distribution of load, particularly that portion caused by diaphragm action. For the latter phase of the test, both static and dynamic loads were applied with diaphragms initially loose, then firmly attached.

Correlation of data already obtained is not yet complete. It is expected that these tests will continue after traffic begins to use the bridge.

Structural Details

The freeway section as completed is four-lane divided, with a 36-foot median providing for an ultimate six-lane section. Each roadway is 24 feet wide, with eight-inch Portland cement concrete pavement placed on four inches of cement treated subgrade on one foot of imported base material. Ten-foot emergency parking shoulders are provided for the outside lanes. They include a three-foot rolled gutter, and 0.40-foot of penetration-treated imported base material, seven feet wide. Five-foot inside shoulders consist of two-foot-wide armor coat on 0.5-foot crusher run base adjacent to the lanes, and three-foot-wide penetration treatment of the imported base material.

The ramp section is, generally, three-inch plant-mixed surfacing on six inches minimum crusher run base, and nine inches minimum of imported base material.

Major Items of Work

The magnitude of the project is evident from approximate quantities of the major items of work:

Roadway excavation	324,000 cu. yds.
Structure excavation	24,300 cu. yds.
Overhaul	5,200,000 sta. yds.
Imported borrow	572,000 tons
Imported base material	331,000 tons
Portland cement concrete (pavement)	26,400 cu. yds.
Structure concrete	8,660 cu. yds.
Structural steel	3,000,000 lbs.
Reinforcing steel	1,000,000 lbs.
Portland cement concrete (curbs, gutters, sidewalks)	7,000 cu. yds.

Among drainage items, approximately five miles of reinforced concrete pipe were placed. Two pumping plants were constructed, one at the Washington Avenue interchange, and one at Williams Street as previously described. In addition, an existing storm ditch in the Washington Avenue interchange area was realigned, and a long culvert constructed to pass the storm water under the freeway and ramps. This structure consists of 303 feet of double 10′ x 4′ reinforced concrete box.

Work on this contract was started in November, 1950, and completed in June, 1952. Progress on the project was delayed by unavailability of structural steel because of defense requirements. Although orders were placed with steel mills in October of 1950, delivery did not begin until July, 1951.

Contract to Cost $3,000,000

Fredrickson & Watson Construction Co. and M & K Corporation are the contractors on Contract 51-4TC17-F, as a joint venture. They also hold the contracts for the adjacent Eastshore Freeway unit southerly, and the section in Santa Clara County between San Jose and Warm Springs. Fredrickson and Watson Construction Co. held the earthwork and paving contract on the first unit from Oak Street to 38th Avenue in Oakland, and were paving and structure contractors on the second main unit from 50th Avenue in Oakland to the San Lorenzo Creek structure. Thus, they have been instrumental on all sections of the Eastshore Freeway except for the High Street (42d Avenue) interchange area and the San Lorenzo Creek Bridge.

The present contract will cost approximately $3,000,000. The work was started under the general supervision of Assistant State Highway Engineer Jno. H. Skeggs, retired. It is continuing under direction of B. W. Booker, Assistant State Highway Engineer, District IV, and Assistant District Engineer R. P. Duffy, with John F. O'Brien as Resident Engineer in direct charge of the work. J. Neil Perry is the Bridge Department representative.

HELPFUL TO MOVIES

RKO RADIO PICTURES, INC.
780 Gower Street, Los Angeles 38

EDITOR

DEAR MR. ADAMS: I have received your magazine for several years now and would like to take the opportunity of thanking you for continuing to mail it to me.

I have driven over most of the California highways in the past years and your magazine keeps me posted on all the latest improvements. I think the March-April, Vol. 31, issue is outstanding with your coverage of the freeway system in and around Los Angeles.

I am employed by RKO Radio Pictures in Hollywood, as chief electrician. I pass your magazine on to the Location and Transportation Departments who find it very helpful in routing our many motion picture companies over California's wonderful highway system all over the State.

Best of luck and good wishes to you in 1952.

Yours truly,

RAY L. SIMBRO
Chief Electrician

FROM ONTARIO

ONTARIO GOOD ROADS ASSOCIATION
Hamilton, Ontario

KENNETH C. ADAMS, *Editor*
California Highways and Public Works
Sacramento, California

DEAR MR. ADAMS: Recently, I had occasion to read your very fine magazine, *California Highways and Public Works.*

I enjoyed the many articles and the photographs dealing with same and feel that your publication is one of the finest of its kind that has been my good fortune to read.

I would appreciate having my name added to your mailing list, if at all possible. It would be much appreciated.

Trusting that I may be able to receive the above publication regularly. Thanking you,

Yours very truly,

T. J. MAHONY

THE SPECTROSCOPE IN CHEMICAL ANALYSIS

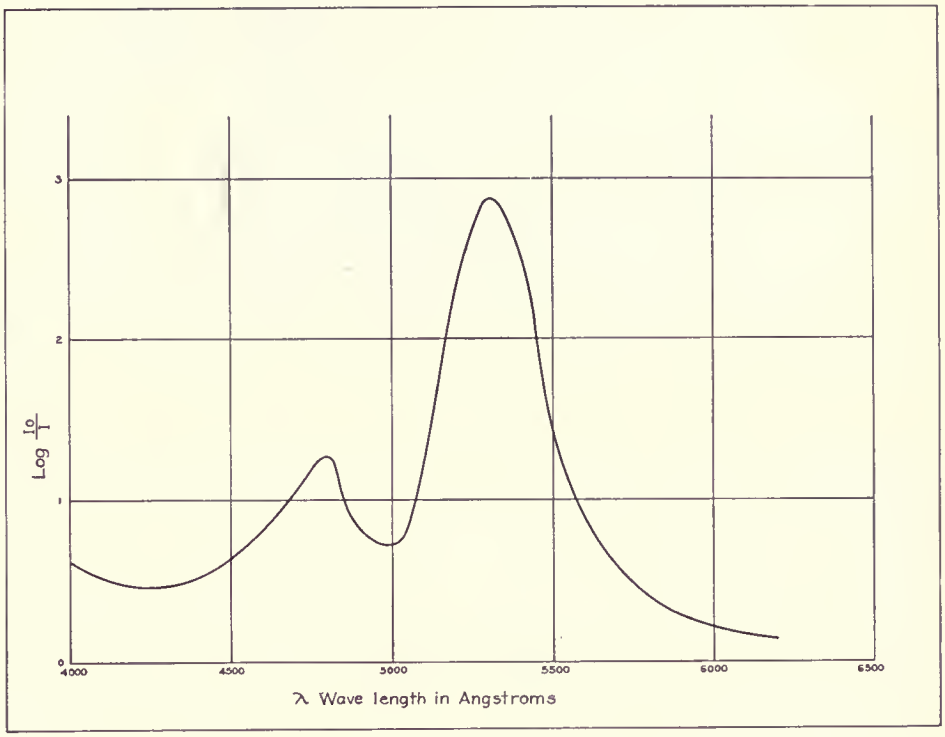
By E. D. BOTTS, Senior Chemical Testing Engineer

The Materials and Research Department of the Division of Highways has recently acquired a spectrophotometer for use in routine chemical analyses and for special research problems.

This device is expected to reduce the time required for many routine analyses with a consequent saving to the State and to make it possible to perform certain work that is very difficult by older methods. The background and development of this instrument is believed to be of interest to many and is discussed in the following article.

In 1860 *Poggendorf's Annalen*, a German scientific journal, contained an article by Kirchoff and Bunsen of Heidelberg University which described a new discovery. These gentlemen had observed that the spectra of flames colored by salts was characteristic of the metallic components. Bunsen's invention of the burner—a device for using and controlling combustible gases as a source of heat—is more widely known but the scientific significance of his observations of flame spectra is infinitely greater. Modern spectroscopy has developed from this modest beginning, and the spectroscope with its modifications and adaptations is rapidly approaching the indispensable in chemical laboratories.

In addition to the observation that a flame colored by salts products a spectrum which is characterized by a definite pattern of lines for each metallic component, Kirchoff and Bunsen noticed that the wave length or position of the lines in the spectra was independent of the temperature of the flame and that more lines could be observed at higher temperatures. This discovery opened the way to a quick method of qualitative analysis and later was developed to such an extent as to permit the analysis of the sun and other astral bodies.



Spectrophotometric absorption curve of a natural red dye in chloroform. Note high absorption around 5400Å —green light.

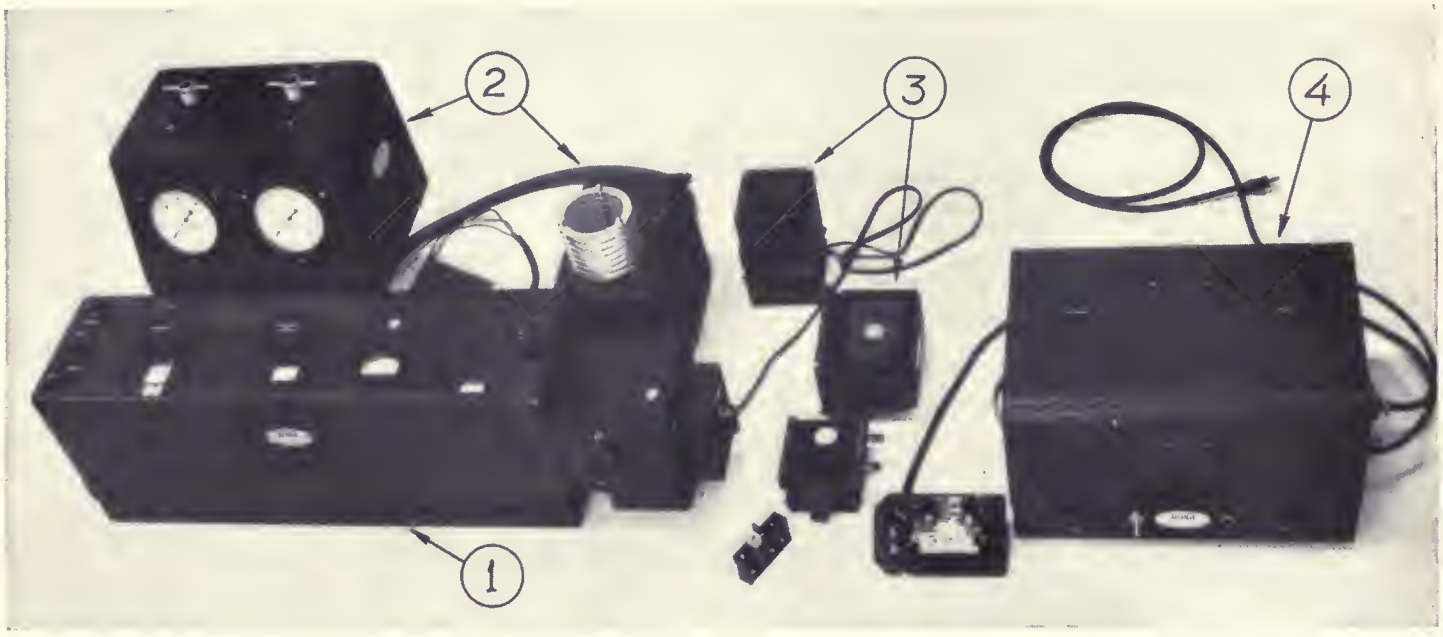
Scientists Make Discovery

Kirchoff and Bunsen, in the early days of their spectroscope, noticed a building in flames on the opposite side of the Neckar river from their laboratory. They proceeded to focus the light on their spectroscope and determined the components of the burning building. That was the first long distance chemical analysis in history.

Other researchers soon discovered additional features and possibilities of the spectroscope. Not the least of these was the fact that fluids would absorb light selectively according to the composition of the fluid. When white or polychromatic light is passed through a solution, absorption takes place selectively, that is, certain wave lengths are absorbed, depending on the composition of the solution. If the light emerging from the solution is passed through a prism and photographed, absorption bands or dark spaces will appear on the film. These bands will correspond to absorbed wave lengths. The location and sharpness of the bands in the spectra will depend upon the character of the solution and its concentration. This gives a basis for identification of many compounds and elements. Even molecular constitution and group orientation may be deduced frequently.

How Instrument Works

The instrument recently acquired by the Materials and Research Laboratory is a combination of the spectroscope and the photocolorimeter. It separates the light into various regions by refraction (some instruments use diffraction) and by means of a highly sensitive photoelectric tube, measures the intensity of the chosen wave length. When the absorption spectra of a solution is required, individual beams of light are passed first through the pure solvent, then through an equal depth of the solution. The difference between the two values constitutes the absorption of the substance dissolved.



Spectrophotometer and accessary equipment recently acquired by the Materials and Research Department. (1) Basic unit; (2) Flame attachment; (3) Diffuse reflectance accessories; (4) Ultra-violet accessories.

If this procedure is carried on through frequent intervals of wave length across the working spectrum, a curve may be drawn which is characteristic of the substance under observation. (*See Fig. 1.*) Various conventions are used in drawing these curves. The most popular is the plot of Log $\frac{I_o}{I}$ against wave length, where I is the intensity of the light after absorption and Io is its intensity prior to absorption. When this convention is used in plotting, with expanding values moving away from the origin, peaks in the curve indicate points of relatively high absorption.

Peak Positions

The peak positions are usually chosen as the wave lengths suitable for making quantitative determinations, because at such position, Log $\frac{I_o}{I}$ = Kcd where K is an absorption constant, c is concentration of the solution and d is the depth of the solution which is penetrated by the light. At any chosen point of maximum absorption for a substance in solution, all factors may be held constant, or nearly so, except c. Calibration curves may be drawn with known concentrations and exact concentrations may be determined in unknowns by a simple measurement.

Modifying attachments are available for these instruments which will permit the preparation of a reflectance chart for all kinds of colored material. A curve, drawn in a similar fashion to that outlined for absorption would define the color accurately. Another attachment provides for excitation of spectral lines by a flame whereby a few of the simpler elements, spectroscopically speaking, may be determined quantitatively from the intensity of a characteristic line emitted by this element.

This method has become almost universal in determining alkalies in cement. It has superseded a long and laborious "wet method" requiring about three days. The spectrophotometer method requires only a few minutes. This instrument simplifies many laborious procedures in the biological field, also. For example, vitamin A in solution, is determined accurately and quickly by measuring its absorption at 3280Å. That is in the ultraviolet region where many substances are highly colored even though they are completely colorless in the visible range—4000Å to 8000Å for the average human eye.

Photo Electric Tube

The accession of the spectrophotometer to a place formerly occupied by the spectrograph (cost up to $50,000) in the laboratory is due primarily to the development of the photo electric tube. This little gadget is far more sensitive to light than any human eye. It is able to pick up the small fragment of light passing through a solution in the range from 2000Å to 10,000Å. When it does this, it responds by releasing a feeble electric current which is proportional to the amount of light exciting it. This current may be amplified to a measurable quantity which is taken as a measure of the intensity of the light involved.

The instrument is generally constructed so that it is largely automatic in its functioning, requiring only the turning of a few dials for the desired end result. Obviously, it is a complicated instrument in which lie the labor and ingenuity of many people for many years. Further refinements will undoubtedly follow. The use of this instrument and its kin is becoming more and more general in laboratories of all kinds. Many of the chemical "wet methods" are being superseded by these more convenient and more rapid physical methods. Some chemists and physicists predict that eventually the analysis of a Portland cement, for example, will involve merely a

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Highway Bridges

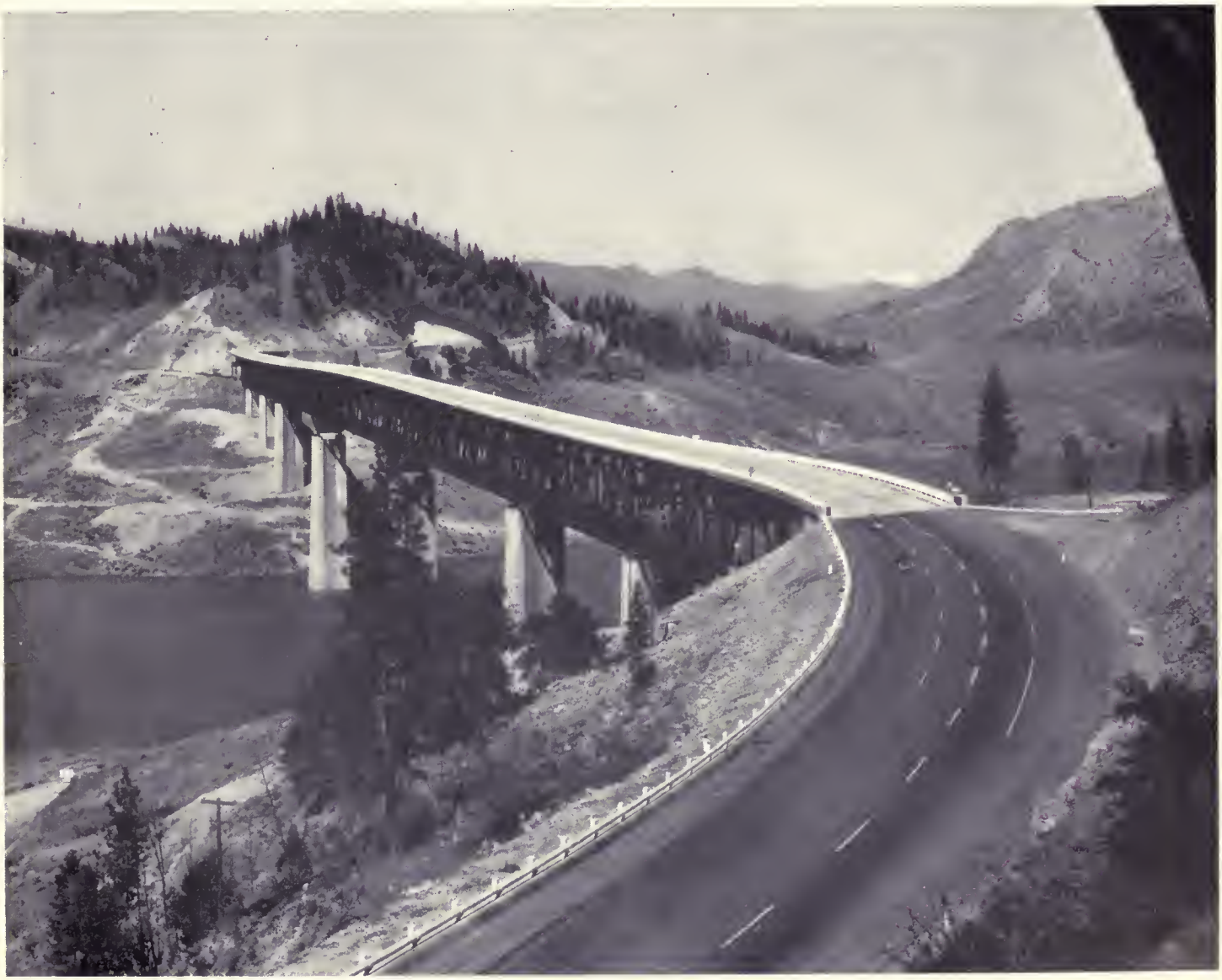
State Maintains Almost 5,000 Such Structures on Its Road System

California, with the Nation's greatest variety of extreme climatic conditions—ranging from subtropical to rain forest conditions on the coast, with swamp, desert, and alpine climates all encountered in the interior—requires an almost unlimited variety of bridge structures to carry her highways. Not only must such natural waterways as arroyos, barrancas, canyons, creeks, rivers, etc., be crossed, but also such artificial features as railroads, footwalks, canals, penstocks, and equestrian trails, to mention but a few. Bridges must be built to carry as many as 105,000 vehicles per day on some Los Angeles freeways, and as few as 20 or 30 vehicles per day on some of the more remote desert and mountain roads.

However, the average motorist pays little attention to bridges as he drives along the highway, even though at 55 miles per hour he crosses a bridge on the average of once every three minutes. Thus, in a typical 100-mile trip, he crosses about 30 bridges. Without bridges highway travel would obviously be impossible.

Since these bridges are such an indispensible part of our highway network, a few interesting statistics relating to bridges on California state routes have been gathered together and are presented here. The statistics do not cover bridges on county roads

Pit River Bridge across Shasta Lake (still being impounded at time this picture was taken). This is one of the few structures which carries both highway and railroad traffic.



and on city streets. Furthermore, the statistics, in general, deal only with those structures 20 feet or more in length; shorter structures are usually classified as culverts.

Almost 5,000 Bridges

On the 15,000-mile State Highway System, there are some 4,800 bridges, with an additional 50 bridges maintained by the Division of Highways in state parks. These bridges, if laid end to end, would extend 120 miles and would cover an area of 527 acres (0.82 square miles). They represent a total value, on the basis of present construction costs, of about 400 million dollars.

Concrete bridges predominate. There are 2,861 bridges of concrete, 587 of steel, 998 built of timber, and 42 masonry arch structures. Incidentally, most of the steel bridges and timber bridges have concrete decks.

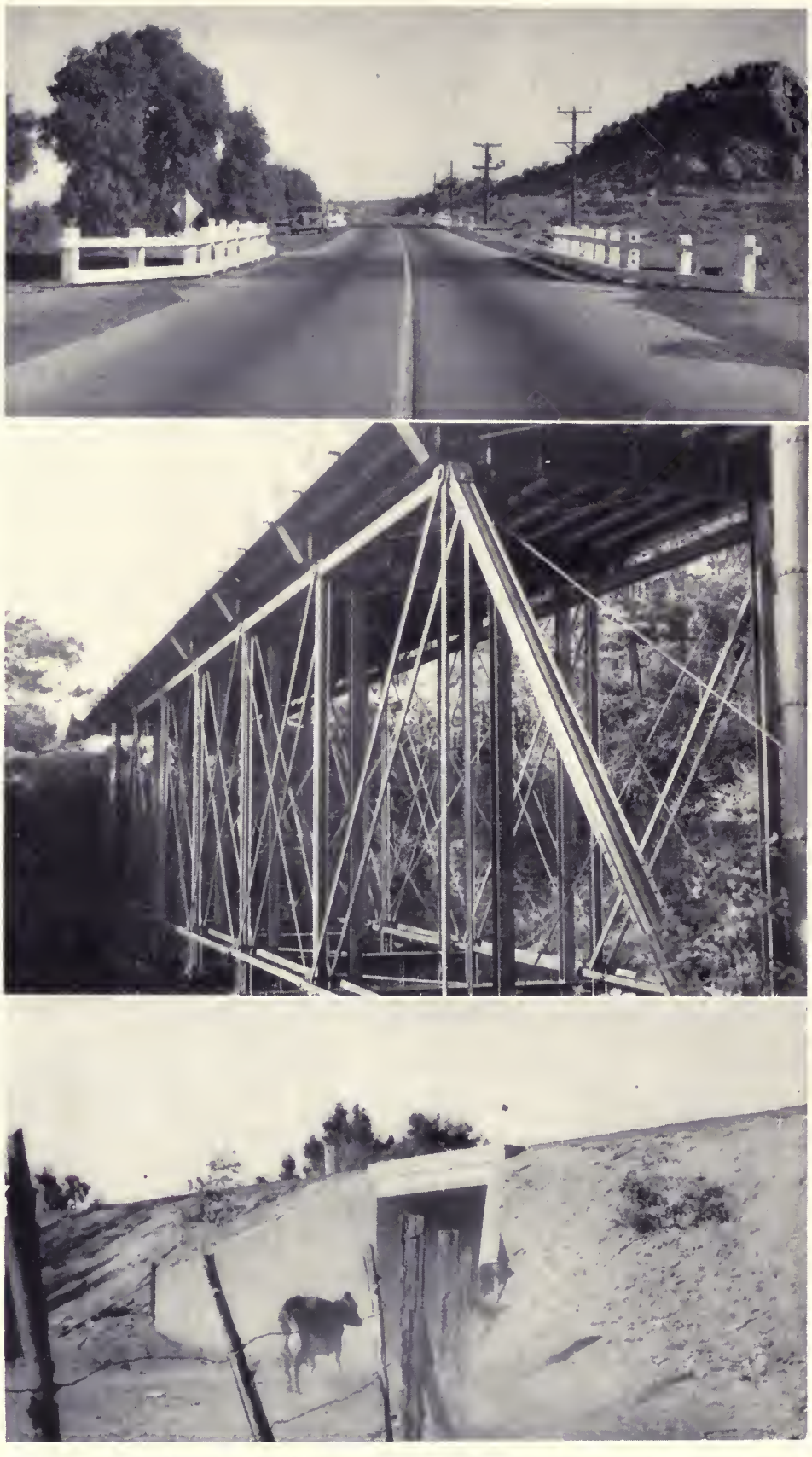
Including those in Yosemite National Park, there are 24 tunnels with a total length of about four miles on the state system. There are 115 structures to permit cattle to pass beneath the highway, 22 structures to allow pedestrians to walk over the highway, and 105 structures for pedestrians to cross beneath the highway. Thus, it is interesting to note, the total number of structures exclusively for pedestrians (127) is almost the same as for cattle. (However, these statistics do not necessarily prove that cattle are very nearly as important as people in California.)

Some Ferries Still Operate

Several ferries still carry traffic at locations where bridges have not yet been constructed. Two of these are on the state system.

Almost 300 structures separate highway traffic from railway traffic. Of these, approximately one-half carry the highway over the railroad, and the other half carry the railroad over the highway. There are still some 909 railroad crossings at grade, or more than three times the number of separations.

On the state system some 29 movable bridges have been erected across navigable streams to permit the passage of water-borne commerce. Of these, 12 are swing bridges (rotating on a center pier), 11 are bascule (opening like a jackknife blade), and six are lift spans (rising like an elevator).



Upper—Near the shore of the Salton Sea (248 feet below sea level). This bridge is one of the lowest in the State. Center—Believed to have been first erected in the 1880's, and formerly carrying one of the now abandoned narrow gauge lines of the Northwestern Pacific Railroad, this structure now carries traffic on Sign Route 1 along the Mendocino County coast. Lower—An unidentified bovine enters cattle pass.

Oldest Bridge

The oldest bridge on the state system is the swing bridge across the entrance to San Leandro Bay connecting the City of Alameda with the Bay Farm Island residential area and the Oakland Airport. This structure, now being replaced with a modern bascule bridge, was originally built by one of California's picturesque early narrow gauge railroads in 1881.

The oldest structure maintained by the Division of Highways is a small stone culvert constructed in the early 1800's at Mission La Purissima, now a state park, and one of the original chain of missions founded by Father Junipero Serra.

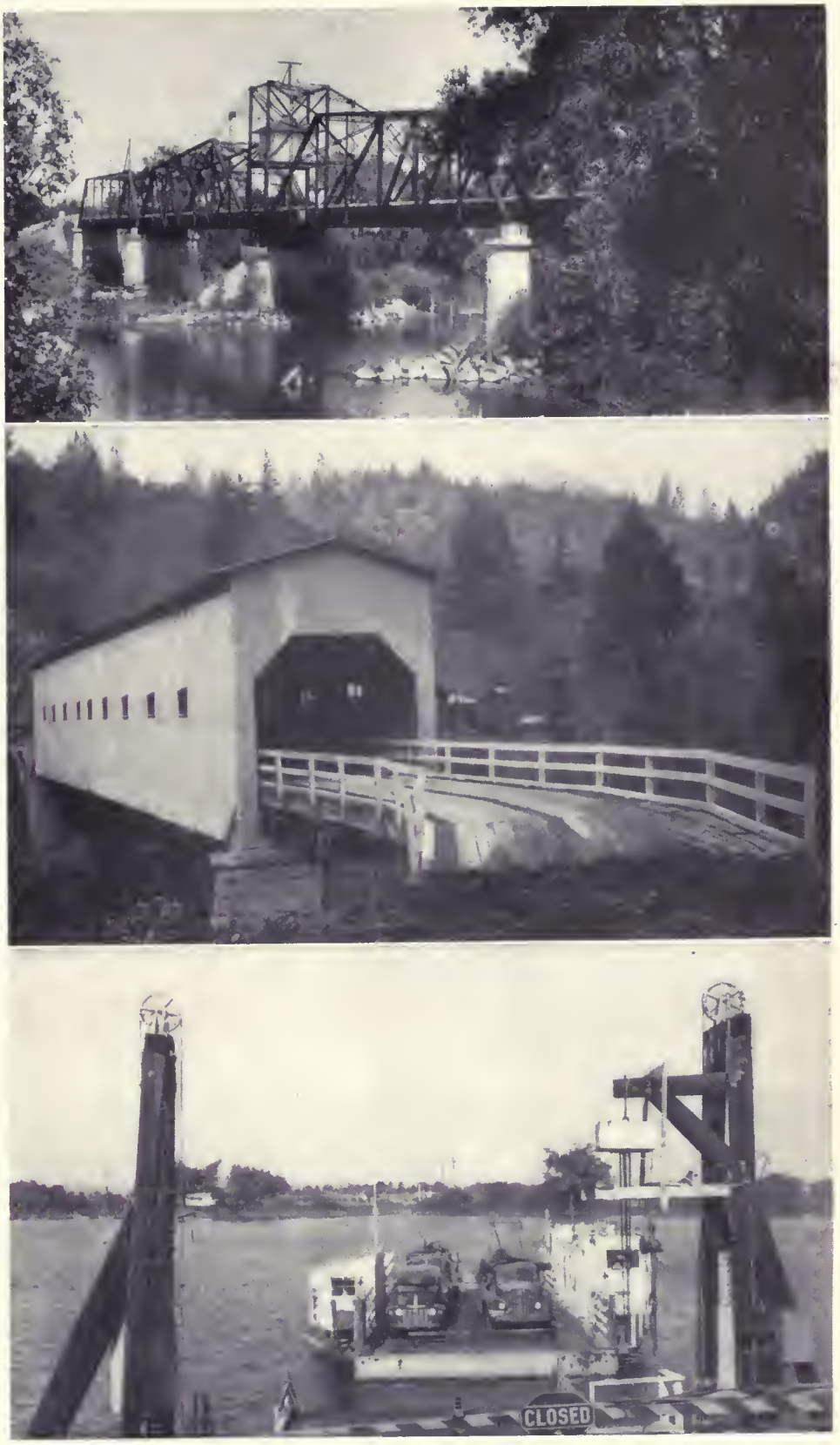
Covered Bridges

Covered bridges, once a familiar and nostalgic sight along California highways, have now disappeared completely. The last covered bridge on the state system was removed about two years ago. However, a few covered bridges remain on county roads.

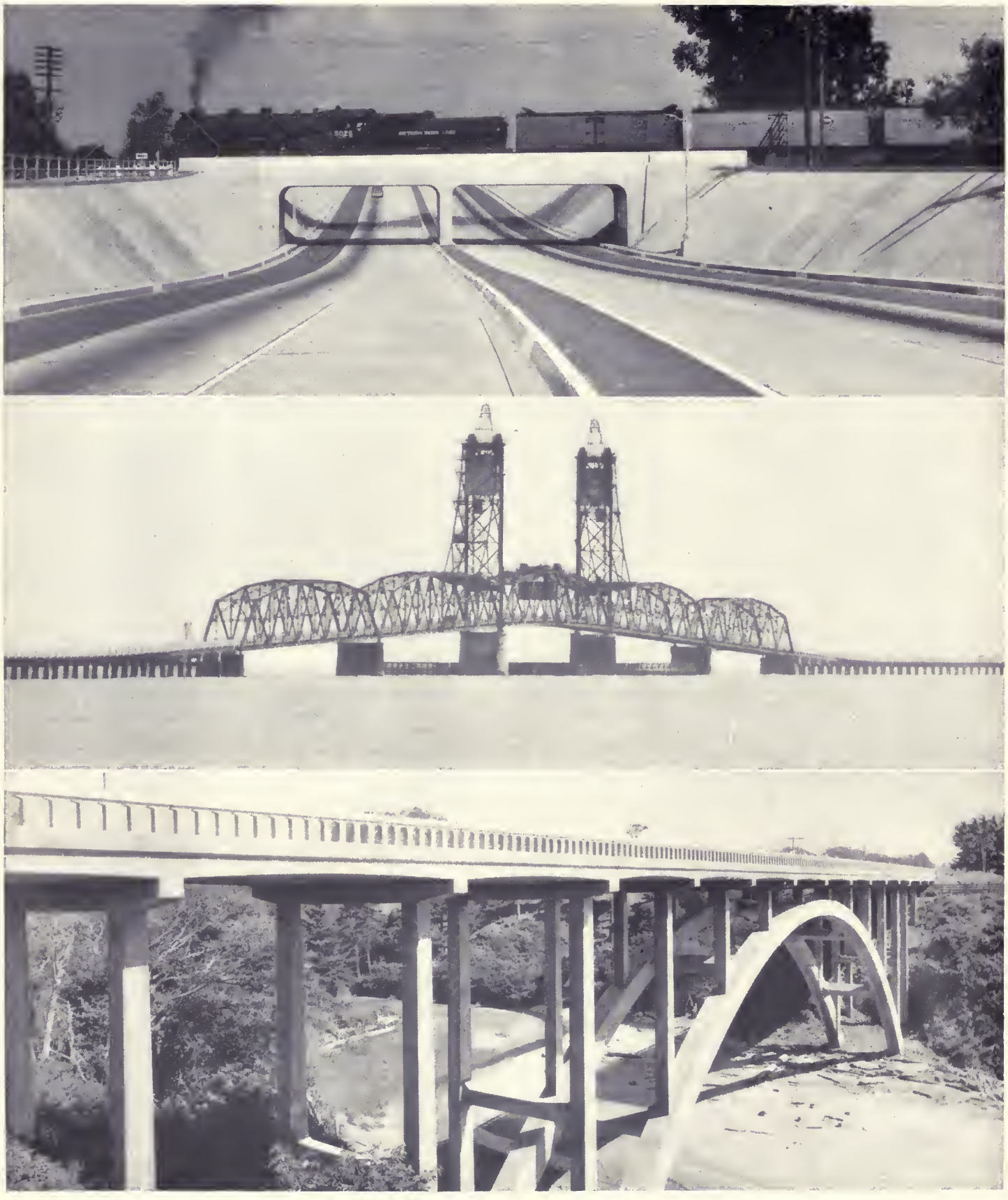
The stream crossing at the highest altitude on the system—located at an elevation of over 9,500 feet—is a corrugated metal arch culvert across Leevining Creek on Tioga Pass, near the east entrance to Yosemite National Park. The lowest bridges in the State are several structures along the shores of the Salton Sea, almost 248 feet below sea level. There are no bridges on the state system in Death Valley, the lowest area in the United States.

Huge Increase Since 1936

During the past 15 years the number of bridges on the highway system has increased by about 1,350; there were only 3,450 bridges in 1936. This tremendous increase has been the result of: 1—construction of parallel bridges when existing two-lane roads are converted into four-lane divided highways; 2—construction of railroad separation structures to eliminate the hazard of railroad grade crossings; 3—construction of freeways, which require numerous highway, pedestrian, and railroad separations, and 4—replacement of old roads on circuitous and tortuous alignment with modern highways on direct alignment. Due to higher standards of design, bridges are often necessary on realignments even



Upper—One of the 29 movable bridges on the state system. This swing structure, built in 1908 across the Sacramento River at Hamilton City, has not been opened (except for experimental purposes) for more than 20 years. Center—Salmon River bridge in Siskiyou County. Removed in 1942, this was one of the last covered bridges on the State Highway System. Lower—One of the two remaining ferries on the State Highway System. This body of water, Coche Slough, will form a portion of the future Sacramento Deep Water Channel.



Upper—One of the 300 railroad separation structures an the State Highway System. Center—Truss spans and lift span of the recently acquired San Mateo-Hayward bridge, one of the four remaining tall bridges. Lower—One at the 277 concrete arches on the State Highway System. Carries Mendocino Coast Highway, Sign Route 1, over Jughandle Creek.



Upper left—Corrugated metal culvert across Leevining Creek, just outside Tioga entrance to Yosemite National Park. Highest stream crossing structure in California. Upper right—Big Oak Flat tunnel in Yosemite National Park. One of the 24 tunnels on the state system. Lower right—Bridge carrying Sign Route 24 across penstocks of the Pacific Gas and Electric Company's Cresta hydroelectric development in the Feather River Canyon, Butte County. Lower left—Pedestrian undercrossing in Contra Costa County.



To the right—Steel girders and a steel deck truss on high steel towers carry the Manterey Coast Highway, Sign Route 1, over Burns Creek.

though they were not required on the original highways.

The numerical increase would be even larger were it not for the fact that many old tumble-down timber trestles—formerly classified as bridges—have now been replaced with culverts, which are not considered as bridges.

Los Angeles County Has Most

Of the total of 4,800 bridges, the largest number—660—are in Los Angeles County. San Bernardino County is second with 420, and Riverside County ranks third with 312. (The majority of San Bernardino and Riverside bridges are timber trestles across the numerous dry washes in the Mojave Desert.) Sierra County with eight bridges has the least of any county in the State.

At the present time there are 107 "posted" bridges on the state system. (A bridge is said to be "posted" when, because of its weak structural condition, the weight of trucks allowed to

cross the structure is restricted to less than the full legal limit, or their speeds restricted to not over 5 or 10 miles per hour.) In 1947 there were some 329 such "posted" bridges. Thus, in the past five years over two-thirds of the "posted" bridges have been replaced.

Of the present 107 "posted" structures, 28 cannot carry full legal loads, and 79 can safely support legal loads only if they cross at very low speeds.

Nearly 1,000 bridges on the system have a width less than 24 feet, which is currently regarded as the absolute minimum for new bridges. Thus, about one out of every five bridges on the state system is narrow, and many are dangerous hazards. However, the present count of 1,000 represents a reduction of almost 400 in the number of narrow bridges as compared with the situation five years ago.

Life of Bridges

Although mortality tables similar to those for human beings cannot be set up for bridges, they often do have a definite statistical service life. For example, of the large number of bridges which existed in 1900, only a handful remain today.

Most frequently the condition necessitating the replacement of a timber structure is decay and deterioration of the timber members. Every year about 40 or 50 older structures must be replaced for this reason. But there are numerous other causes for bridge replacement. On the average, two or three of the older bridges are seriously damaged or destroyed by flood waters each year. Usually, at least one bridge each year is burned in some sort of truck accident, and another is demolished by a truck but does not burn. One or two bridges must be replaced each year because of inundation by a reservoir development.

For purposes of economic analysis, the bridges constructed today are often considered to have an average life of from 50 to 75 years. No doubt, a few will endure for 2,000 years (as have some of the Roman bridges), while others, due to unpredictable occurrences, will disappear within 5 or 10 years.

Bridges Are "Big Business"

The construction and maintenance of bridges in California is definitely a "big business" operation. Currently, about $30,000,000 is expended on new state structures each year.



Dolan Creek Bridge on Sign Route 1, Monterey County. Only timber arch of its type on highway system.

The largest and most expensive concrete bridge now under construction is the new six-lane Colorado Street arch bridge across the Arroyo Seco in Pasadena. Its cost will exceed $2,400,000. However, in terms of cost the Arroyo Seco Arch will be dwarfed by the steel viaduct carrying the Bayshore Freeway over a section of the downtown area of San Francisco. Work is now under way on some portions of this viaduct, and its ultimate total cost is expected to be about $15,000,000.

The cost of maintenance and repairs to the 4,800 state bridges totals over $240,000 per year, or an average of $50 per bridge per year. However, this does not include maintenance of the San Francisco-Oakland Bay Bridge, where painting alone requires the full-time employment of from 50 to 60 persons and costs more than one-third million dollars per year. Cost of maintenance of the Golden Gate Bridge is in excess of $280,000 per year. (The Golden Gate Bridge, the longest single span in the world, is operated by the Golden Gate Bridge and Highway District and technically is not a part of the state system.)

About $13,000,000 per year is expended by the counties and cities in California for the construction and maintenance of other bridges not on the state system.

Sidewalk "Supers"

In District VII Ancient Craft Is In Keeping With Modern Times

By A. D. GRIFFIN, Assistant District Engineer

When mythology was in the making some 5,000 years ago, Hercules had considerable difficulty with his task of cleaning out the Augean Stables. As fast as he threw the refuse out the door, it came back in through the windows. What mythology does not relate, however, is that Hercules was not successful in this task until sidewalk superintendents took over. By leaning in at the windows to see what was going on, they blocked off the openings through which the refuse returned and enabled Hercules to complete his project.

Then some two thousand years ago, when Julius Caesar was following up his conquests by engaging in vast public works, history records him as saying: "Gallia est omnis divisa in partes tres laborum facilius video." Latin texts do not contain the last three words because scholars have been unable to agree on the proper translation. They were inclined to reason that "laborum facilius video" was Caesar's way of saying: "easy-vision television!" This conclusion, it would seem, might well be taken in the same vein as the claim by archeologists some years ago, when radio was called "wireless," that since no wires were found in the tomb of King Tutankhamen, this indicated that ancient Egyptians had radios. A much more logical interpretation of Caesar's remark is that he had Gaul divided into three parts for administrative purposes so that sidewalk superintendents could view the work more easily and not have to travel so far from their homes to construction jobs.

Role of Sidewalk Superintendents

Be that as it may, modern contractors do recognize the value of having sidewalk superintendents on their jobs. Observers of construction work have, from time to time, offered worthwhile suggestions as to how difficult operations could be simplified. Then too, sidewalk superintendents perform an important function in spreading information concerning construction work of vital importance. Many times they build up the morale of workmen on the job who realize that their efforts are being viewed and appreciated. Much heretofore unthought of is now being done for the comfort and convenience of sidewalk superintendents.

Up until a few years ago sidewalk superintendents had to find their own knotholes or bring their own boxes to stand on to look over the high board fences which always surround interesting construction activities. Then modern-thinking contractors began to drill peep holes in their fences at convenient heights so that sidewalk superintendents, whether tall or short, could find apertures at eye level through which to view construction work more easily.

A New Idea

A year ago the Guy F. Atkinson Company, contractor on the $3,500,000 bridge over the Arroyo Seco for the Colorado Freeway, took a big step forward and built a sidewalk superintendents' house at a vantage point on the job. This building measures 20 feet by 30 feet and has wide windows on all sides so that construction activities can be easily viewed. In the center there is a model of the bridge structure on a scale of 1 inch equals 20 feet so that sidewalk superintendents, after viewing disconnected units of construction out on the site, can look at the model and see how the various parts will fit together in the final product. Mr. Atkinson believes this model is of value not only to sidewalk superintendents but also to his own workmen who frequently come in to look at it in order to more easily interpret the plans. By visualizing the completed structure as shown by the model, they can then work out intricate details of form construction more easily.

This is thought to be the first instance where a contractor has taken such elaborate pains to provide adequate housing for sidewalk superintendents viewing his work. They are regarded as important personages by Guy F. Atkinson Company, which maintains a folio-size ledger on a table in this building in which sidewalk superintendents may record their names and addresses. This is certainly a striking indication of the belated recognition that is being accorded the profession of sidewalk superintending and a demonstration of how much it has come up in the world during recent years.

Television Takes Part

However, that was still the problem of transportation for sidewalk superintendents between home and construction. Origin and destination surveys would show unquestionably that some sidewalk superintendents come great distances to view construction activities. Providing transportation for themselves has placed quite a severe burden on sidewalk superintendents.

It has remained for Television Station KTTV, Channel 11, to solve this problem by bringing the construction job into the homes of sidewalk superintendents. This station is operated by the *Los Angeles Times*, and its studio is located in large buildings on the southeast corner of Sunset Boulevard and Van Ness Avenue, directly west of the Hollywood Freeway. When the original studies were being made for the freeway location surveys, the KTTV studio buildings were used as a control and every effort was made to so locate the Hollywood Freeway that these buildings would not be interfered with. The Division of Highways was not 100 percent successful in attaining this objective, as it was necessary to locate an inlet ramp for southbound traffic from Sunset Boulevard close to the easterly side of the



Upper—Observation post for sidewalk superintendents on site of Colorodo Freeway bridge in Pasadena. This building erected by Guy F. Atkinson Co., the contractor. Lower—Construction operations on Colorado Freeway bridge as viewed from observation post building.

studio buildings. To make an adequate connection with Sunset Boulevard, it was necessary to clip a triangular section about 20 feet long from one of the studio buildings.

Fine Vantage Point

Producer Roy Maypole, on the staff of General Manager Richard Moore of KTTV, recognized the superb vantage point that the roof of the studio afforded for viewing construction operations on the Webb & White contract on the Hollywood Freeway from Western Avenue to Hollywood Boulevard, since the studio is just about equidistance from these two terminal points of this important contract. The Webb & White contract has an allotment of $1,461,600 and calls for grading, paving, and incidental work to provide an eight-lane freeway for the 0.7-mile length between Western Avenue and Hollywood Boulevard. Grade separation bridges for cross streets have been constructed under previous contracts at Western Avenue, Fountain Avenue, Wilton Place, and Sunset Boulevard, and construction is nearing completion by the contractors, Fredericksen & Kasler, on the bridge to carry Hollywood Boulevard over the freeway. The Webb & White contract consists of completing all necessary construction to provide the eight-lane freeway under these bridge structures.

Heavy Excavation

There were approximately 600,000 cubic yards of roadway excavation to be hauled away. Some of this excavation was hauled onto the Harbor Freeway in order to make roadway embankment approaches to grade separation bridges on this freeway, and the balance of the roadway excavation was hauled to the State Division of Highways disposal area in Chavez Ravine Canyon about one mile northerly from the Los Angeles Civic Center.

Program Arranged

Mr. Maypole realized the dramatic features connected with the operating of modern earth-moving machinery and equipment, and decided to bring these operations to his television audiences. He arranged for 25 minutes of program time between 1 and 1.30 p.m. Mondays through Fridays.



Looking southeasterly from roof of KTTV studio along Hollywood Freeway showing construction in progress. Wilton Place overcrossing in foreground. Roy Maypole, KTTV producer, left, interviews Haig Ayanian, Resident Engineer, Division of Highways, during broadcast of Sidewalk Superintendent television program.

Mr. Maypole decided to call his program "Sidewalk Superintendents," and he contacted P. O. Harding, Assistant State Highway Engineer in charge of District VII, asking his aid in making the programs interesting, instructive, and generally worthwhile to the television audiences. Mr. Harding delegated to the author the responsibility for conferring with Mr. Maypole and arranging details. Mr. Maypole's idea was that he and a representative of the District VII staff of the State Division of Highways would consider themselves as sidewalk superintendents on the ground viewing construction operations, and that the two of them would carry on informal conversation such as would be expected of two sidewalk superintendents inspecting construction operations of considerable magnitude.

The television camera was set up on the roof of the KTTV studio building nearest the freeway so that good vision could be had of construction operations in both directions along the freeway.

Time and again when the cameraman focused on a distant scene, the sidewalk superintendents on the roof behind the cameraman could not make out the details of the construction operation in progress, but the viewers over the television screen could see the close-up in minute detail. To that extent, at least, sidewalk superintendents in the television audiences had the advantage over the sidewalk superintendents on the roof or those that are always in evidence from vantage points on the ground.

First Broadcast April 1

The first broadcast was made on April 1st, with Resident Engineer Ray Collins being interviewed by Producer Roy Maypole while the camera was showing construction scenes on the Hollywood Freeway.

Then on April 2d Mr. Spencer Webb and Mr. James White, the partners in the contracting firm of Webb & White, were interviewed and gave information regarding construction activities on their contract.

On subsequent days during the month of April, the following representatives of the District VII staff appeared on this television program: R. W. Anderson, District Priorities Engineer; Haig Ayanian, Resident Engineer; Charles Beer, Assistant District Traffic Engineer; H. E. Belford, Resident Engineer; R. H. Butler, Assistant District Construction Engineer; Ray Collins, Resident Engineer; John Davidson, Maintenance Superintendent; Earl Dewing, Assistant District Materials Engineer; Basil Frykland, Resident Engineer; J. W. Greathead, Right of Way Clearance Agent; A. D. Griffin, Assistant District Engineer; Dexter MacBride, Senior Right of Way Agent; W. A. McIntyre, Bridge Department Resident Engineer; J. E. McMahon, Supervising Bridge Engineer; Milton F. Masters, Resident Engineer; A. L. Olmsted, District Landscaping Engineer; W. D. Sedgwick, Assistant District Engineer; Jack Sylvester, Bridge Department Resident Engineer; Jim Woodbridge, Bridge Department Resident Engineer.



Interior of sidewalk superintendents building showing model of new 6-lane Colorado Freeway bridge and the old 2-lane bridge that remains in service.

Mr. Maypole conducted the interviews on KTTV's "Sidewalk Superintendents" program in a most commendable manner. It was probably due to the fact that the interviews were carried out in an informal manner that these programs were received by the general public so enthusiastically. KTTV received so many complimentary telephone calls and letters that it felt justified in continuing this program through the entire month of April.

Typical of letters received was the following:

9161 Duarte Road,
San Gabriel, California
May 8, 1952

KTTV (Channel 11)
Hollywood, California

GENTLEMEN: I am sorry that "Sidewalk Superintendent" has gone off the air, for it has been my favorite daytime TV program for several weeks. It has been entertaining as well as informative, and I have learned many interesting facts from the questions Roy Maypole has asked state highway engineers in regard to the construction of our Los Angeles freeways.

It has been fascinating to sit here in my living room in San Gabriel and see what is going on in Hollywood; the operation of bulldozers and power shovels on the freeway construction project, traffic and pedestrians on Sunset Boulevard, glimpses of the beautiful Hollywood hills and Griffith Observatory, and wonderful TV close-ups made possible by the Zoomar camera lens.

I particularly liked the program when the State Geologist talked about fossils found herein Southern California, and the specimens that appeared on my TV screen showed outlines and patterns even more clearly than real-life fossils I have seen in museums. That thousands of years ago buffaloes and Indians roamed over Southern California, and that millions of years ago this Country was under water, are facts that never before had been called to my attention.

Hoping that Sidewalk Superintendent (or a reasonable facsimile of it) will appear again on television in the near future, and with many thanks to KTTV and all those who contributed to such an enjoyable program, I am

Sincerely yours,

(Mrs.) LEONORA A. PHILBROOK

Highway Engineers Assist

The representatives of the State Division of Highways who appeared on this program were there primarily for discussion and comments on the construction operations being photographed by the television camera. Generally speaking, the comments were just what might be expected of any sidewalk superintendents viewing work of this character. However, Producer Maypole took cognizance of the position held by the Division of Highways representative with whom he was conversing, and often led the discussion into fields of interest concerning the specialty of the man he was interviewing. For instance, one of the Bridge Department resident engineers had made a special study of prestressed concrete, and this subject was discussed with him while the camera was focused on nearby bridge structures over the Hollywood Freeway. Then when visiting resident engineers stationed on

construction contracts on neighboring freeways—the Harbor, Ramona, and Santa Ana Freeways—were interviewed, discussion was led into channels to bring out what was progressing on these particular freeways.

Discussions Varied

In a similar manner, when men representing District VII right-of-way organization appeared on the program, the discussion covered subjects of interest concerning right-of-way acquisition and clearance. It was brought out in connection with the moving of underground utilities at the site of the Sunset Boulevard bridge that coaxial cables, designated as "video" cables, are utilized to transmit television programs from the television stations in Hollywood to Mt. Wilson for amplification and rebroadcasting. Also, within the range of the KTTV television camera was the site of a 40-unit hotel-apartment building that had been moved all in one piece to a new location to make way for the Hollywood Freeway. Details of this operation were described on the television program.

Maintenance Department representatives, in addition to participating in general discussions, had opportunities to talk at considerable length on the problems which maintenance forces have in clearing trash from state highways. A description was given of the new "vacuum cleaner" now in operation that can pick up bottles and cans along with the lighter debris. Also, in one of the broadcasts wintertime problems of snow removal from state highways in the mountainous areas were discussed. Other subjects of this nature, sometimes far afield from the construction being viewed by the television camera, were frequently covered in the broadcasts. In a sense, the action pictures coming over the television screen of construction operations close to the studio served as a background for the conversation between the KTTV producer and the State Division of Highways representative. This was the situation when such subjects were discussed as traffic engineering, steel priorities, functional landscaping for erosion control, and structural geology.



Workmen of Consolidated Western Steel Division of United States Steel balanced on ladders to secure a 78-ton steel girder in place on the Simons Underpass of the Santa Ana Freeway, east of Los Angeles. The girder, largest of its kind ever erected by Consolidated Western engineers in freeway construction, is one of the center spans of a 1,247 ton four-track bridge which goes over the super highway.

The broadcasts were greatly enjoyed by the television audiences doubtless because they were something entirely different from other televised programs, showing construction activities where progress could be noted from day to day, and because variation in the programs was obtained by having representatives of different departments of the District VII organization appearing on consecutive days.

It is believed that much valuable information has been given to the KTTV television audiences during these broadcasts and that viewers now have a far better idea than before of the activities of the State Division of Highways, its problems and its objectives. The television audiences and the State Division of Highways owe KTTV a vote of thanks for putting on this unique series of "sidewalk superintendents" programs.

Erosion Control

Economic Aspects of Reducing Soil Loss From Highway Slopes Discussed

By H. DANA BOWERS, Landscape Engineer

It has not been too many years since the traveling public took mud on the highway for granted as being a natural consequence of storm action, and wise drivers drove cautiously because they knew conditions would almost certainly be dangerous. Eroded banks like the one shown below were commonplace, and soil eroded from these banks by even moderate rains had to be picked up and hauled away before the roadway could be considered safe for normal usage.

Fortunately, considerable progress has been made in reducing soil loss from slopes. Slope treatment has been developed to the point where very little erosion is evident after a storm of moderate intensity, and normal usage of the highway is now seldom restricted because of mud on the pavement.

Problem Not Solved

The partial failures of slope protection which result from extremely high intensity rains which come before the soil has become completely consolidated and the cover of vegetation completely established, are evidence that the slope protection problem has not been completely solved as yet. However, even these partial failures do not affect more than a small proportion of the treated area, and when the failed portion is properly repaired it withstands severe storms without further attention.



Heavy growth of vegetation on 2:1 treated slope near Carlsbad. Although the subsoil is identical with that shown in the picture above, the flattened slope plus topsoil and straw treatment provide favorable conditions for the development of a protective cover. This is one season's growth. (San Diego County)

Eroded, untreated 1:1 excavation slope near Carlsbad. Every storm deposits more soil in the gutter, and no relief is in sight. Vegetation cannot become established in the sterile subsoil subject to constant erosion. (San Diego County)



That it is desirable to prevent soil loss from highway slopes is unquestionable. That the cost of preventing soil loss is less than the cost of picking up and hauling away sloughed material year after year plus the intangible cost involved in danger and delay to the traveling public would seem on the surface to be obvious. Yet we should have comparative costs in order to more completely justify the money spent for slope protection during construction of the highway.

Cost Difficult to Determine

The exact cost involved in picking up and disposing of sloughed soil by

maintenance forces is difficult to determine, since the removal of minor ditch or slope ravelings is considered a routine maintenance operation and the cost thereof is included with other items. Major slide removal and storm damage repair, for which a separate cost is kept, includes removal of slides, restoration of slip outs and excessive settlements as well as the repair of damage to the roadway and facilities occasioned by storms, floods, earthquakes, etc., plus plantings necessitated in erosion repair.

It would seem to be impractical to attempt to separate the cost of removing material which could be definitely said to be the result of slope erosion from the cost of removing material deposited on the highway by slides, runoff from adjacent lands, drainage failures and other causes which could not be corrected by slope treatment, since the cleanup procedure does not involve separate operations. Therefore, a description of what happened during one recent storm on a project under construction, and the cost of cleaning up eroded soil and restoring the slope may serve to indicate the value of slope protection in dollars and cents.



Oceanside slope after cleanup, restoration and treatment. (San Diego County)

Oceanside Project

On the project now under construction through Oceanside, XI-SD-2-Ocn, between one-fourth mile south of Mission Avenue and the San Luis Rey River, slope protection, involving slope preparation (roughening), topsoil and straw cover was specified for all excavation slopes, since the soil is highly erosive in nature. By January 15, 1952, the contractor had completed slope protection work on most of the slopes and had just finished spreading topsoil on the slope shown on the left of the picture below. Spreading and rolling of the straw cover was scheduled for the next day, but the next day it started to rain.

On January 16th, 0.43 inches of rain fell; on January 17th, 1.09 inches fell; and on January 18th, 1.62 inches was recorded, most of this amount coming down at cloudburst intensity.

The soil, thoroughly saturated by the preliminary wetting, simply melted and came to rest at the bottom of the slope. It is interesting to note here that the slope on the right upon which the slope treatment had been completed withstood the storm almost perfectly. Damage on the treated slope consisted of two or three very small areas which were restored in a couple of hours by a man with a hand shovel.

Soil loss from the recently topsoiled slope at Oceanside after the storm of January 18, 1952. Protection treatment had been completed before the storm, on the slope on the right, and damage was negligible. See text for details. (San Diego County)



Some Cost Figures

The area of the eroded slope is 5,025 square yards. The contractor's cost for cleaning up and disposing of the eroded material was $427.71. This works out to $0.085 per square yard for comparative purposes.

The cost of slope treatment, based on the contractor's bid prices of $0.10 per square yard for slope preparation and $50 per ton for straw to be spread and rolled at the rate of four tons per acre works out to $0.1413 per square yard. The cost of topsoil is included in the excavation quantities and is disregarded in this comparison.

While it would appear at first glance that the cost of slope treatment would be exceeded by the cost of picking up and disposing of the sloughed material from two storms, in this case the conclusion is not quite accurate. Freshly

spread, uncompacted topsoil or cultivated material is extremely susceptible to erosion, and if the soil on the slope under consideration had been compacted by several light rains before the "gully washer" came, no such wholesale loss of soil would have taken place. However, if no slope preparation, topsoil or straw had been applied, some soil loss would have taken place, as it did on the freshly graded slope above the old road in the accompanying picture, and maintenance forces would be faced with the never-ending job of cleaning up after each storm. An eroded slope like this continues to lose soil year after year.



Recently protected 2:1 bank in the foreground withstood the storm of January 18 without damage. Compare with the old eroded ½:1 bank in the background. Note absence of growth on constantly eroding bank. (Near Carlsbad, San Diego County)

Topsoil Necessary for Planting

It might be argued that the best way to keep topsoil from washing off a bank during a storm like this would be to leave it off entirely. That would be fine, provided an adequate growth of vegetation which would provide permanent protection could be established without the use of topsoil. However, it appears to be necessary to provide a layer of loose soil in order to obtain plant growth of effective density, and of course proper incorporation of straw with the soil is impossible unless the soil is loose.

In localities where topsoil is scarce, we have provided for cultivation of the subsoil and addition of fertilizer in an attempt to establish vegetation, but growth has been rather weak and sparse and cannot compare with the lush stand of grass and weeds shown in the first picture of the protected slope near Carlsbad. Besides, cultivated subsoil erodes from the bank even more readily than topsoil does, if a storm strikes before slope treatment has been completed.

Fertility, humus, and soil bacteria and other micro-organisms contained in good topsoil encourage the healthy growth of plants. Seeds of the varieties of plants which have become naturally established in the locality are also brought in with the topsoil, and these plants take over the permanent protection job quite rapidly. Therefore, it would seem that the advantages gained by the use of topsoil wherever it can be economically obtained outweigh the disadvantages of occasional losses.

Freshly graded slope above on old road at Oceanside after the storm of January 18, 1952. Soil loss has started, and will continue. (San Diego County)



Some Questions

Anyone who attempts to establish the dollars and cents value of slope protection comes sooner or later to the intangible things which must be taken into account in evaluating the worth of a method. What monetary value can be fairly placed upon the reduction of hazards to traffic through keeping the traveled way unobstructed by mud and slough? What value can be given to the improved appearance of a smooth vegetated slope as compared to a raw gullied bank? Drainage obstruction, deposition of silt upon adjacent lands, emergency calls for the maintenance crews—all these items cost somebody some money, but how can we convert the cost into price per square yard for comparative purposes?

Although the intangible values add to the worth of slope protection by some undetermined amount, it does not seem necessary to rely upon that

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Upper—NBC's agile Cameraman Leppert taking a law angle shot while dumping aperatians are being explained by Mr. Hansan af the Gaad Raads Machinery Campany af Minerva, Ohia, wha flew aut especially to inspect the vacuum cleaner. Lawer—NBC Cameraman Leppert getting close-up view af vacuum cleaner abaut ta suck up tin cans and other debris.

State Highways Vacuum Cleaner Is on Television

By W. F. AXTMAN
Assistant District Maintenance Engineer

THE NOVEMBER-DECEMBER, 1951, issue of *California Highways and Public Works* magazine, starting on page 46, carried a story by W. D. Sedgwick, Assistant District Engineer in charge of District VII maintenance, entitled: "Vacuum Cleaner . . . New Machine Gathers Trash Motorists Throw on Highways."

This story in our magazine was the basis of many reprint articles in other magazines and publications throughout the Nation and, as a result, many inquiries about the machine have been



received, including one from a foreign country. One of these stories must have come to the attention of the New York office of the National Broadcasting Company because Mr. Sedgwick received a call from the Los Angeles office of NBC stating it would like to have an opportunity to take moving pictures of the vacuum cleaner in operation which could be used for nation-wide telecasts. Arrangements were made and on May 5th, while the vacuum cleaner was operating on the Ramona Freeway near the east city limits of Los Angeles, Jack Leppert, one of the ace television newsreel photographers, was given the assignment by NBC to photograph the operations. Accompanying this story are photographs showing the vacuum cleaner in operation while being photographed by him.

Mr. Leppert took approximately 500 feet of standard-size motion picture

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Traffic Safety

Emphasis Placed on Greater Cooperation Between Agencies

THE ACCOMPANYING editorial, which appeared in the Santa Barbara *News-Press*, is timely and appropriate in view of the many serious traffic safety problems in California. It typifies the statewide thinking being encouraged by the California Conference on Traffic Safety to coordinate the various approaches to greater traffic safety on the part of the enforcement agencies, the educational agencies, and the engineering agencies.

The 1952 session of the California Conference on Traffic Safety has just been called by Governor Earl Warren for October 2d-3d in Sacramento.

The writer of the editorial, Herbert F. Orriss, Associate Editor of the *News-Press*, was recently honored with an award of merit from the California Safety Council for his journalistic contributions to increased safety consciousness in his community.

Driver Factor

Research into the "driver factor" in traffic accidents as advocated in the accompanying editorial actually is now being undertaken on a nation-wide scale.

A Committee on Highway Safety Research was established in 1951 in Washington, D. C., as a unit of the National Academy of Sciences—National Research Council, and held its first Highway Safety Research Correlation Conference on June 5th and 6th in the Nation's capital.

J. C. Young, Traffic Engineer for the California Division of Highways, was one of the specialists in traffic engineering invited to participate in the conference, along with experts in several other scientific and engineering fields.

The purpose of the committee is "to correlate and stimulate research on highway safety, with emphasis on the human factors in relation to engineering and physical factors." It expects to bring to bear on the problem the different research activities and viewpoints of all the many scientific divisions of the Academy-Council.

"Great progress has been made over the last 20 years in the fields of highway and traffic engineering, enforcement and safety education," it was recently stated by Dr. T. W. Forbes, executive secretary of the committee, "and the death and injury rate per hundred million miles of travel has been very greatly reduced. However, due to increased mileage and exposure, the actual *number* of deaths and injuries has *increased* to such an extent that, on the basis of present estimates, 10 percent of the population of the United States may be expected to be killed or injured in highway accidents in a period of from 10 to 15 years.

"Thus, highway safety has become a critical social problem and leaders in this field are convinced that more information on the human phases of the problem is vital. For this reason there is a pressing need for research on a nation-wide scale in all of the scientific and engineering fields related to human behavior on the highway."

RESEARCH INTO THE DRIVER FACTOR IN TRAFFIC ACCIDENTS

From time to time, companies that have a great many motor vehicles traveling on the highways and that hire a large number of drivers, give a dinner, or some kind of ceremony, at which honor is paid to drivers with exceptionally good safety records. A few days ago the Safeway Stores, Inc., had such a meeting. There were 175 truck drivers present. One of the drivers received an award for 20 years of driving without an accident. Thirty-six of the drivers received awards for 10 years of driving without an accident.

Whenever such awards are given to men who drive almost all the time of their employment—year after year, without an accident—it gives the average driver, who probably does not drive more than 5 to 10 hours a week, something to think about.

We charge accidents to many things—to lack of safe highway construction, proper signal lights, proper enforcement of traffic laws, the speed or carelessness of the other fellow, bad weather conditions and so on. The truck driver who is honored for safe driving contends with all of these things. He contends with them 10 times or more as much as the average driver of a pleasure car.

The big part of the traffic safety problem must be in the driver. If that is so, the big part of traffic safety campaigns should have to do with drivers. Besides our study of traffic flows and engineering problems we need more and better studies of the differences between drivers who have accidents and drivers who do not have accidents.

If a number of accidents happen on a certain section of road, that section of road is studied carefully to see what is the matter. If the trouble is discovered, or any trouble is discovered, that piece of road is reconstructed to eliminate the danger. We do not carry out the same policy and theory as much as we should in connection with drivers. If a driver has a number of accidents, no special study is made of his or her makeup, to see what changes or safety measures should be taken.

It should be plain that, if some drivers can drive for 20 years without accidents on the same roads and under the same conditions that other drivers have frequent accidents, something about the drivers needs study—as much study as the construction of the roads and the accident prevention equipment and methods in use.

Mere knowledge of driving and vehicle construction and the vehicle code are not sufficient. It is almost certain that the "20 years safe driving" drivers would not be able to pass examinations on such subjects with higher grades than many drivers who have more than their share of accidents.

Of all the research that is going on now, to save lives and cure sickness and injury, there are many that cannot produce as much results as a research which would bring about—driverwise—a 10 percent reduction in traffic deaths and injuries. So, why not a serious and adequately conceived research into the driver cause of traffic accidents?

Santa Barbara News-Press

DRIVING SKILL

Do you take pride in your driving, or is it something you give no more thought to than washing dishes or watering the lawn? Take pride in your skill behind the wheel; that skill may help you to avoid trouble someday.

Retirements *from* Service

JAMES M. HODGES

On May 1, 1932, James M. Hodges, Supervising Highway Engineer on the District VII staff, announced his retirement from state service.

Jim, as he is known throughout the State, started his highway service with District VII on December 28, 1914, as an axeman on one of the survey parties on the original survey for the "Old Ridge Route." From December 12, 1917, to August 1, 1919, during World War I, he was on military leave with the Army in France. Upon his return to civilian life, Jim advanced through the various survey party positions and was instrument man at the time he left District VII on May 18, 1920, when he resigned to accept out-of-state employment.



JAMES M. HODGES

Jim returned to State Division of Highways service December 1, 1928, to accept a position as Resident Engineer in District VIII. When portions of Riverside County and Imperial County were relinquished by District VIII in 1933 to become a part of the new District XI with headquarters in San Diego, Jim, with other personnel on construction assignments in those areas, automatically became District XI employees.

On April 25, 1936, Jim transferred to Sacramento Headquarters Office where he worked for a period of five years on the office engineer's staff. On March 16, 1941, he became District Maintenance Engineer for District IX, with headquarters in Bishop, which position he held until August 1, 1947. On this date Jim transferred again to

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STANLEY McCULLOCH

Stanley C. McCulloch, Associate Materials and Research Engineer, retired on March 10th after 28 years of state service.

Mr. McCulloch was in charge of the Los Angeles Branch of the Materials and Research Department for the 26 years prior to his retirement.

Stanley was born on January 21, 1895, at Waukomis Garfield, Oklahoma. After graduation from the Waurika Oklahoma High School, he attended the Oklahoma Normal School. He subsequently attended the enlisted specialist school and spent time in the coast artillery officers training camp.

After a short time at teaching, a session in the Army, and periods with the Army Engineers and the Pacific Telephone and Telegraph Company, he started work for the California Highway Commission in January, 1924.

Stanley's first state assignment was in the drafting room of District III. He transferred to District VII in July of the same year (1924). After serving in District VII for two years, he transferred to the Materials and Research Department to open a materials sampling and inspection office at Second and Spring Streets in Los Angeles. That office, under Mr. McCulloch's supervision, became known as the Los Angeles Branch of the Materials and Research Department.

In 1942, Stanley and his group moved to the present location of the branch at 1523 East Firestone Boulevard. Since Stanley's retirement, that office is under the direct supervision of Bill Bennett.

Mr. McCulloch is well-known to state engineers in Sacramento and the districts; however, he was best known in the southern area, where his activities were almost entirely confined during the past 26 years. He plans to live near Indio.

J. B. HODGES

J. B. Hodges, who has been Office Engineer in District III for many years, retired on May 15, 1952, after 31 years of state service. Joe first worked for the Division of Highways in 1914 but took some time out to go to college, serve in the Army, and get a little outside experience before returning for good in 1922.



J. B. HODGES

Joe worked several years for District VII in the Los Angeles area as an assistant resident and resident engineer on construction projects, before transferring to District II in 1930 as district construction engineer. His period of service in Redding was a little over five years, his transfer to District III having occurred in June of 1935.

Joe's work in District III began with an assignment as district office engineer. At that time, the duties of this position included supervision of all survey and plan activities. He was kept extremely busy and often spent many hours of his own time seeking information necessary to complete the design of a project to his satisfaction. As the work expanded, reassignments of duties were made and Joe was designated surveys and plans engineer and later again became district office engineer, the position he held at the time of his retirement.

Joe's many friends in the Division of Highways will miss him and join in wishing him enjoyment of the retirement years ahead.

WILLIAM H. EPPERSON

William H. Epperson, Supervising Mechanical and Electrical Engineer for the Division of Architecture, retired on April 4, 1952, after serving the State in various capacities for 21 years.



WILLIAM H. EPPERSON

Bill Epperson, widely known and one of the most highly regarded members of the Sacramento-San Jose vicinities (for the past 50 years), first came to the division as a mechanical draftsman on December 26, 1917. At this time the division was known as the Bureau of Architecture, of the Department of Engineering.

Epperson is a native son of Durham, California, where he spent his early years helping his father in a general merchandising store. While there, he prepared for an engineering career by studying I. C. S. courses. After four years of service in the Navy, in which he attained the rank of fireman, first class, Bill found he had a liking for mechanical work. He was employed as an engineer by P. G. & E. Company, for whom he worked until he entered state service on December 26, 1917.

Enters Private Industry

Epperson served five months with the division, leaving on May 31, 1918, and returning February 7, 1919. He resigned from the division on January 24, 1923, to enter the private construction industry, in which field he was active until 1935, during which time he served as mechanical inspector in the construction of the Medico-Dental Building and the Fitzhugh Building, both in San Francisco. He started as mechanical engineer for the Pacific Gas and Electric Building, and wound up as the superintendent of the project. During his years in private industry, he served as superintendent on many building projects in the West. Among these were the El Tejon Hotel in Bakersfield, California, the Montevista Hotel in Flagstaff, Arizona, the New Hotel in Idaho Falls, Idaho, the Governor Hotel at Bellingham, Washington.

On September 16, 1935, Epperson returned to state service as an associate mechanical engineer in the Mechanical Section of the Division of Architecture, in which capacity he served until 1939, when he was promoted to chief office building engineer, Department of Finance. In 1946 he returned to the Division of Architecture as senior mechanical engineer in time to supervise the rehabilitation of the State Fairgrounds, after occupation by the Army during World War II.

Wins Promotion

In 1948 he was promoted to supervising mechanical and electrical engineer and assigned to work as an assistant to Carl E. Berg, whom he succeeded in December of that year, as district construction supervisor of the Sacramento district. He was promoted by TAU to area construction supervisor in 1950, and served until November 1, 1951.

During the three years in which he headed the Sacramento area of the Division of Architecture, he supervised the erection of $83,516,345 worth of construction at more than 40 different sites. This includes sites from Dorris and Tulelake to Porterville, including among other jobs, the erection of the Porterville State Hospital at Porterville, which is the largest single construction job ever undertaken by the Division of Architecture, the project consisting of the erection of an entire mental institution costing $7,120,853. He also supervised the construction of the Deuel Vocational Institution at Tracy.

Supervised Capitol Annex

By far the greatest monument to the construction ability of Bill Epperson, however, is the new annex to the State Capitol, which was erected under his supervision. This building, one of the finest in the Country, is the only state capitol building in the United States known to have been erected within the original estimate, which is a matter of great pride to the Division of Architecture.

In preparation for retirement, Bill turned his area over to J. W. Cook in November of 1951, after which Epperson began a five-month special survey of mechanical work throughout the entire State under the immediate direction of D. C. Willett, Chief Construction Engineer. At the completion of this work, he formally retired from the Division of Architecture, but not from construction.

Mr. and Mrs. Epperson plan to reside in their cabin in Paradise, where Bill expects to build a mountainside home in his spare time in the next few years, after which he and Mrs. Epperson plan to divide their time between their home and such traveling as they may wish to do.

UNDERGRADUATE WRITES

Los Angeles 48,
May 17, 1952

Editor
California Highways and Public Works

Dear Sir: May I take this opportunity to thank you for placing my name on your mailing list. I am an undergraduate engineer in the College of Engineering, University of California, Los Angeles, and your excellent magazine keeps me informed of the engineering projects and problems found in actual practice. Already the first two issues I have received have helped me immeasurably in a report I was asked to write concerning the freeway system of the Los Angeles area. I am hopefully looking forward to future issues.

Yours truly,

Claude Benedix

J. M. HODGES

Continued from page 27 . . .

Sacramento and worked until March 23, 1949, on the office engineer's staff.

He then returned to District VII as Assistant District Engineer in Charge of Surveys. This is the position which he held until the time of his retirement. Jim was responsible for the district materials staff and the District Hydraulics and Drainage Department, as well as the District Survey Department. In this position he had general supervision over an engineering staff of approximately 150 men, whose activities permeated to a considerable extent through all phases of the engineering work done by District VII.

Late Fishing

High Sierra Passes Blocked to Anglers by Record-Breaking Snowfall

THE RECORD-BREAKING SNOW of the past winter will bar many High Sierra anglers from their favorite lakes and streams this year beyond the opening date of the fishing season, according to the California Division of Highways.

Some of the lofty mountain highways, which have been blocked by snow all winter, lead to many of the popular fishing and other recreational areas in the State, particularly in the region south of Lake Tahoe.

Understandably, the home and cabin owners, the resort operators and the campers join the fishermen in an annual plea to the Division of Highways to get the winter's accumulation of snow out of the way quickly so that they can reach their recreational haunts.

Tough Situation

Unfortunately, highway maintenance crews are up against a tougher situation than most people realize. This is particularly true in an abnormally heavy snow year like the present one, which has broken this century's records for total snow pack at any one time and total snowfall for the whole season.

Spring may be busting out all over in the valleys, but in the high mountains an April shower may still be a snowstorm, the thermometer seldom reaches as high as 60 degrees during the day and drops to freezing or near freezing at night.

The most seriously affected area stretches from Lake Tahoe to the higher passes to the south—Carson, Ebbetts, Sonora and Tioga—all of which are snowbound and closed to traffic during the winter months.

In the Tahoe area and farther north the state highways across the Sierra are kept open all year, except under the severest storm conditions, such as the blizzards of last January.

Normal Openings

Sole exception to the "open all year" group of state highways in the Tahoe section is the portion of the west lakeshore highway between Richardson's and Bliss Park. This is avalanche country, which in 1935 claimed the life of a highway maintenance man. To open this section before the slide danger is past would endanger the life of anyone driving over it, a risk which the

... Continued on page 49



Some idea of the tremendous task facing the State Division of Highways in reopening the High Sierra passes in the spring and summer may be obtained from this picture, taken near the summit of Carson Pass during the latter part of May, 1951. The snow pack last year was for less than this year's abnormally heavy accumulation, the greatest in more than half a century. The tractor in the foreground is breaking up the icy crust and pushing the loosened snow to the rotary plow which propels it out of the roadway trench. Supplementary equipment, including a fuel truck (shown in the deep trench in the background), follow as the rotary plow inches its way toward Carson Summit.



In an address before the twenty-eighth annual convention of the Mission Trails Association in Santa Monica on May 23d Highway Commissioner Harrison R. Baker, in reviewing improvements made on U. S. 101 which Father Junipero Serra and his padres mapped out 180 years ago when they were founding their string of missions, used the accompanying sketches by Van der Goes, Bridge Department, Division of Highways, to illustrate his talk.

Baker said in part:

"The California Highway Commission necessarily works and thinks in terms of our tremendous load of highway deficiencies. Of our nearly 14,000 miles of state highway, more than 11,000 are deficient in one or more respects—structurally, or from the standpoint of safety, or, most glaring of all, because of inadequate traffic capacity. Your association is acutely aware of these deficiencies in the counties which you represent, and the Highway Commission appreciates and values your continued counsel in our effort to accomplish the most possible within the limits of legal requirements and available financing. You have helped to center public attention on the need for highway improvements, and you have been equally ready to center public attention on projects which have been completed and which enhance the pleasure of the motorist in following the "path of the padres."

"The opening this month of nearly four miles between Palm City and Chula Vista brings the Montgomery Freeway to completion from Palm City to San Diego. North of the city, the widening of U. S. 101 from Del Mar to Encinitas has been provided for in the 1952-53 Budget.

Oceanside-Carlsbad Project

"Work is well under way on more than 11 miles of freeway which will eliminate bottlenecks in the Oceanside-Carlsbad area; several contracts are involved, including the widening of the bridge over the San Luis Rey River. They total nearly $9,000,000. The most recent contract, on the section through Carlsbad, was awarded one month ago.

"Beginning in Orange County we enter the region of what is perhaps the most ambitious concentrated planning program of highway construction ever undertaken—the Los Angeles Metro-



politan Freeway network. A portion of this network is already in operation. One of its major units—the 10-mile Hollywood Freeway between the Civic Center and Vineland Avenue in the San Fernando Valley—has been completely financed, and construction is under way on the final sections between Western Avenue and Cahuenga Pass. By the end of 1953 the Hollywood Freeway should be completed.

Los Angeles Freeways

"In the meantime, work is under way on the short connection just east of the Civic Center which will link the Hollywood and the Santa Ana and Ramona Freeways; on the connection between the four-level distribution structure and the Arroyo Seco Parkway; on the Harbor and River Freeways; and on the new Colorado Freeway Bridge.

"The Los Angeles Metropolitan Freeway System is important to your association in more ways than one. It not only enhances the visitor's motoring pleasure and permits him to spend more time on recreation and less time battling traffic; also, because of its bold conception and well-designed construction it cannot help but serve as a tourist attraction in itself. Publications of national circulation have been asking increasingly for pictures and information about it. We may come to find in the next few years that the nucleus of the metropolitan freeway network, the four-level distribution structure, is one of our most famous Mission Trails landmarks.

In Ventura County

"In Ventura County, I am happy to report that construction is scheduled to begin this summer on the grade separation over the Southern Pacific main line tracks at Camarillo. This $600,000 overhead will eliminate the last remaining grade crossing of U. S. 101 and the Southern Pacific main line between Los Angeles and San Francisco. Another Ventura County project was just completed a few weeks ago: the short but important four-lane divided section between the Santa Clara River Bridge and Montalvo.

"A little west of the Ventura County line in Santa Barbara County, construction is well under way on the 3½ miles of expressway west of Carpinteria which leads up to Ortega Hill.



SOUTHERN CALIFORNIA FREEWAYS

THE METROPOLITAN AREA OF LOS ANGELES AN

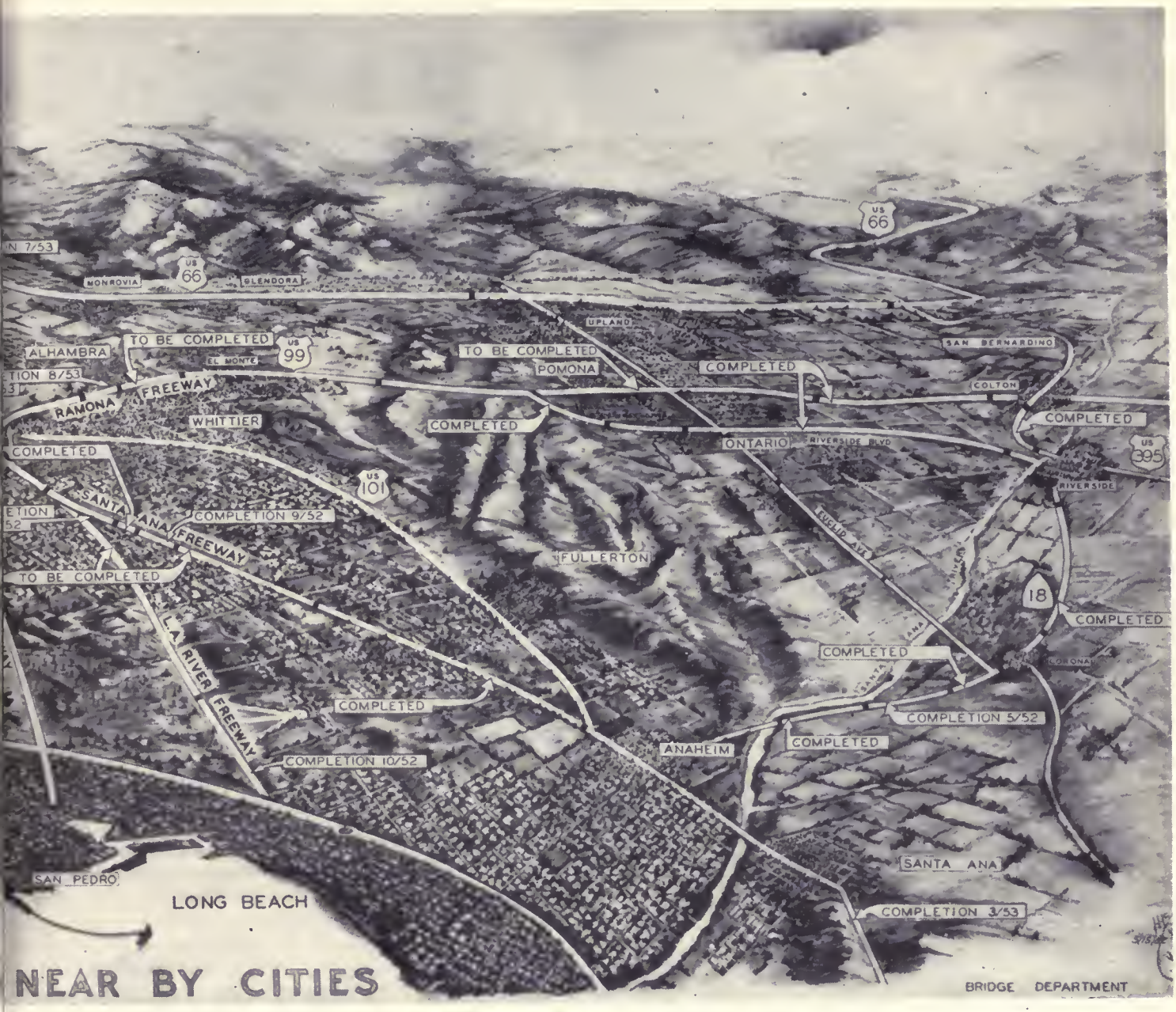
Gaviota Pass

"North of Santa Barbara, you will be particularly interested in the Gaviota Pass project which is now in full swing. In 1950 the Division of Highways started on a three-year program to improve the scenic eight-mile section from Gaviota north over Nojoqui Summit as a four-lane divided highway. The Nojoqui Summit portion was completed last fall. The section just south of it, from the north end of Gaviota Gorge to Las Cruces, is scheduled for completion in the next few months. The contract for the three miles northerly from the settlement of Gaviota was awarded April 1st and construction is under way. Meanwhile, work on the Gaviota tunnel, which was holed through in February, is in full swing. It is through this tunnel that the northbound traveler will pass on his journey along El Camino Real.

"As you know, the historic importance and interest of Gaviota Pass is inseparably linked with its topography. The steep, narrow defile which played a unique role in the conquest of California by Fremont could very well have been altered beyond recognition by excavation for a new roadway. Instead, the new roadway will go through the heart of the rock for 420 feet, and the historic integrity of the gorge will be preserved. The south portal of the tunnel will be finished with a sandstone-colored stain so that it will blend in with the landscape as far as possible. Plans also included a parking area several hundred feet south of the tunnel. The bronze plaque which tells the story of the pass will be moved to the parking area for the edification of the traveler.

In San Luis Obispo County

"There is a good deal of progress to be observed in San Luis Obispo County, also. A good start is being made on the freeway through the City of San Luis Obispo, with several grade



separation structures under way. A contract for two more structures was awarded on May 6th.

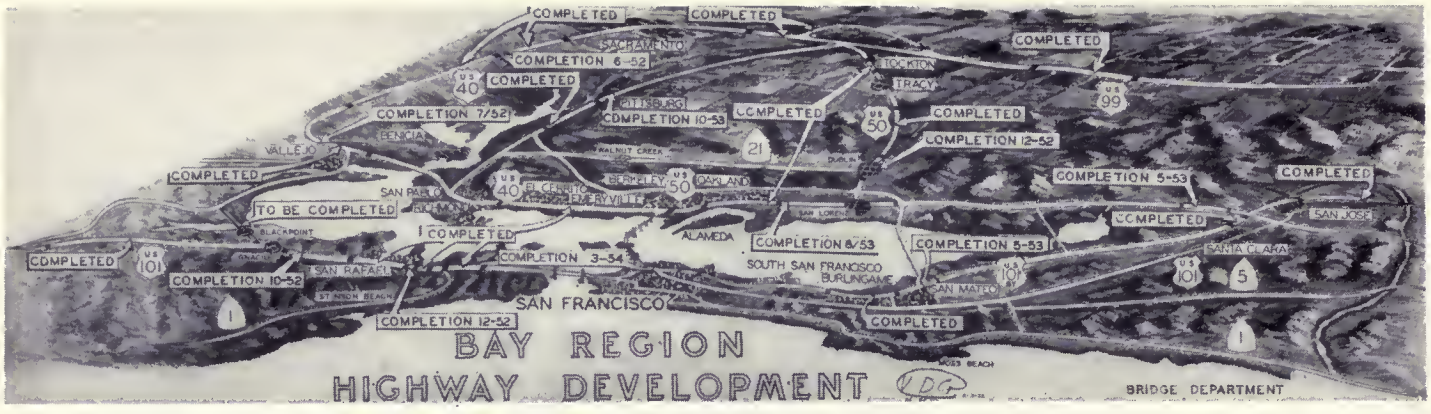
"The four-lane divided construction between Atascadero and Templeton was completed last July. This expressway will be continued on through Paso Robles. Grading of the southerly six miles will be completed in August, and bids have been called on the remaining grading and on some of the surfacing. They will be opened on June 4th, which means that construction will continue on this project without interruption.

"A start has been made on the gigantic job of improving the long stretch of U. S. 101 which follows the Salinas River through Monterey County. Two new lanes were completed last fall for 5.3 miles north from Chualar. The new roadway is being used while the old section is being brought up to modern standards; this contract has just got under way.

Salinas Freeway

"The long-planned freeway through Salinas is about to become a reality. Bids will be opened in Sacramento next Wednesday for 1.6 miles of grading, paving and structures north from Alisal Road, the first unit of this important project.

"In Santa Clara County, a large share of attention has been devoted to the southern end of the new Eastshore Freeway, but numerous other projects have been and are being carried on. The most recent ones have been the surfacing of five one-half miles of U. S. 101 in the vicinity of Gilroy and the widening and surfacing of a section just south of San Jose. Projects are also under way and budgeted which will improve Sign Routes 9 and 117, leading to Santa Cruz. The relocation of Sign Route 17 in the vicinity of Lexington Dam has just been completed.



Bayshore Freeway

"On the Bayshore Highway there is a good deal of activity under way in an attempt to remedy the congestion and accident situation during the necessary interval while freeway construction is pushed forward. Lights and signals are being installed, and traffic channelization projects are being constructed and planned. Meanwhile, construction is in progress on the extension of the freeway from the north to the south city limits of San Mateo.

"In San Francisco itself construction on the Bayshore Freeway north from Army Street is continuing. Bids were opened on May 14th on the initial grading and structures in the important section lying between Sixteenth and Seventh Streets.

"In the meantime we are proceeding at full speed on our present basis. The Highway Commission is continuing to lay the groundwork for future development by declaring additional miles of U. S. 101 and other highways as freeways, after concluding freeway discussions with the local governmental agencies concerned. This is done, of course, far in advance of actual construction. For example, during the past several months the commission has concluded freeway agreements and adopted routings of U. S. 101 for three miles through and near the town of San Miguel and for eight miles in Santa Barbara County between Buellton and Los Alamos. The mileage of declared—not constructed—freeway on the coast route between San Diego and San Francisco now amounts to 345 miles, or about 63 percent of the total distance.

Advance Planning

"Advance planning is particularly important in view of the need for highways built on freeway design standards, with a minimum of entrances, exits and turns at grade to impede the flow of through traffic. It is obvious that the earliest possible selection of the best and most economical route is not only essential to protect property values, but also to ensure orderly long-range community planning and to prevent costly misunderstandings.

"In considering the highway conditions from a state-wide view and from the view of U. S. 101 improvement you will recall that some 11,000 miles of the 14,000 miles of state highways are deficient in one respect or another, with the estimated cost of correction being about three billion dollars. Of the 550 miles of U. S. 101 from the Mexican border to San Francisco, some 420 miles are included in the list of current deficiencies, with estimated cost of correction being about $259,000,000. This cost on U. S. 101 is the balance which will remain after the completion of $21,000,000 worth of major improvements included in the 1952-53 Budget."

"FOLLOW THE LEADER" DANGEROUS GAME

Don't play "follow the leader" in traffic, warns the National Automobile Club. Just because the other fellow slipped through that stop sign or cut in on that other car is no indication that you can do so safely. When you indulge in such tricks you are taking these long chances that lead to a short life.

Restoring of Mission Bells Is Proposed

Restoration of the picturesque mission bells of El Camino Real, long a symbol of California to tourists, has been proposed to the Mission Trails Association.

"The bells are rapidly disappearing, either through vandalism or relocation of U. S. Highway 101," it was pointed out in a letter to Jack Daugherty, President of the Mission Trails Association, by E. E. East, Chief Engineer of the Automobile Club of Southern California.

Few of the original 450 bells erected along the El Camino Real from San Diego to Sonoma are still standing. And some of these were left along the old highway after the relocation of Highway 101, East said.

Designed by the late Mrs. Armitage S. C. Forbes, historian of old California, the first bell was erected in 1906 at the Plaza Church in Los Angeles.

Within a decade, the Mission Trails Association, then known as El Camino Real Association, had placed an average of one every mile along the historical route followed by Don Gaspar de Portola in 1769.

The original bells were donated to the Mission Trails Association by counties, chambers of commerce and civic groups, and maintained in Southern California by the auto club.

East said he discussed the replacing and relocation of the bells with some supervisors and other county officials, who indicated they would cooperate in restoring them.

Arch Falsework

Construction on Colorado Freeway Bridge Over the Arroyo Seco

By H. R. LENDECKE, Resident Engineer, and
C. H. KNIGHT, Assistant Resident Engineer

The new Colorado Freeway in Pasadena will be carried across the famous Arroyo Seco on massive concrete arches which will rank among the largest in the world. Of the three sets of twin-arch ribs the longest spans a distance of 302 feet between spring lines, rises 120 feet above the bottom of the Arroyo and will support a deck measuring over 100 feet in width. Each of the twin ribs in this span is 24 feet wide and varies in thickness from three feet at the crown to five feet at the haunch.

Untried Methods

Constructing an arch of such proportions made it seem desirable to adopt new untried methods which in turn presented many unique problems. Twin arches with as much as 38 feet between them further complicated the problem, but immediately suggested the idea of movable centering.

Working with this idea, materials on hand and the need for maintaining adequate space for movement of heavy equipment under the falsework, Contractor Guy F. Atkinson Company planned and designed their arch centering. Its description herein will be confined to the center (302-foot) span. In brief the substructure of the centering consists of four steel towers with steel column bents adjacent to the piers. Each tower has six legs built up from 12-inch and 14-inch bearing piles and X-braced with light steel angles. Each tower leg is supported on a concrete footing pad resting either on timber piles or disintegrated granodiorite bedrock. To allow for lowering the towers each leg was set up nine inches on four 2-inch screw jacks. Grout pads were then placed between the column bases and the concrete footings.

Rolled I-Beams

Supported directly by the towers are longitudinal 36-inch by 230-pound to 300-pound rolled I-beams spliced rigidly together with bolted connections. The slope of each beam follows the general slope of the portion of the arch next to it. These I-beams, in turn, support 12-inch by 53-pound bearing piles used as purlins. Built up from the purlins are timber stringers, blocking, camber strips made of bent 4 x 6s, 2 x 6 joists and finally the plywood soffit forms.



Detail showing 2-inch screw jacks which have been partially lowered. 100-ton hydraulic jack at right carried column load while screw jacks were being lowered. Grout pads which had been placed between the column bases and the concrete footings during concrete placing operations have been removed.

The sequence of concrete placing operations was set up by the State in the contract plans to minimize movement of the centering and thereby eliminate construction stresses. A section 80 feet long at the crown was poured first, followed by the haunches and alternate intermediate sections on each side. To allow for shrinkage of the concrete the final "key" pours

were made after a curing period of 10 days from the next to last pour. During the placing operations careful measurements were made of all settlements and lateral movements. In addition strain gauge measurements were made on the tower legs to determine the distribution of the concrete load during placing operations.

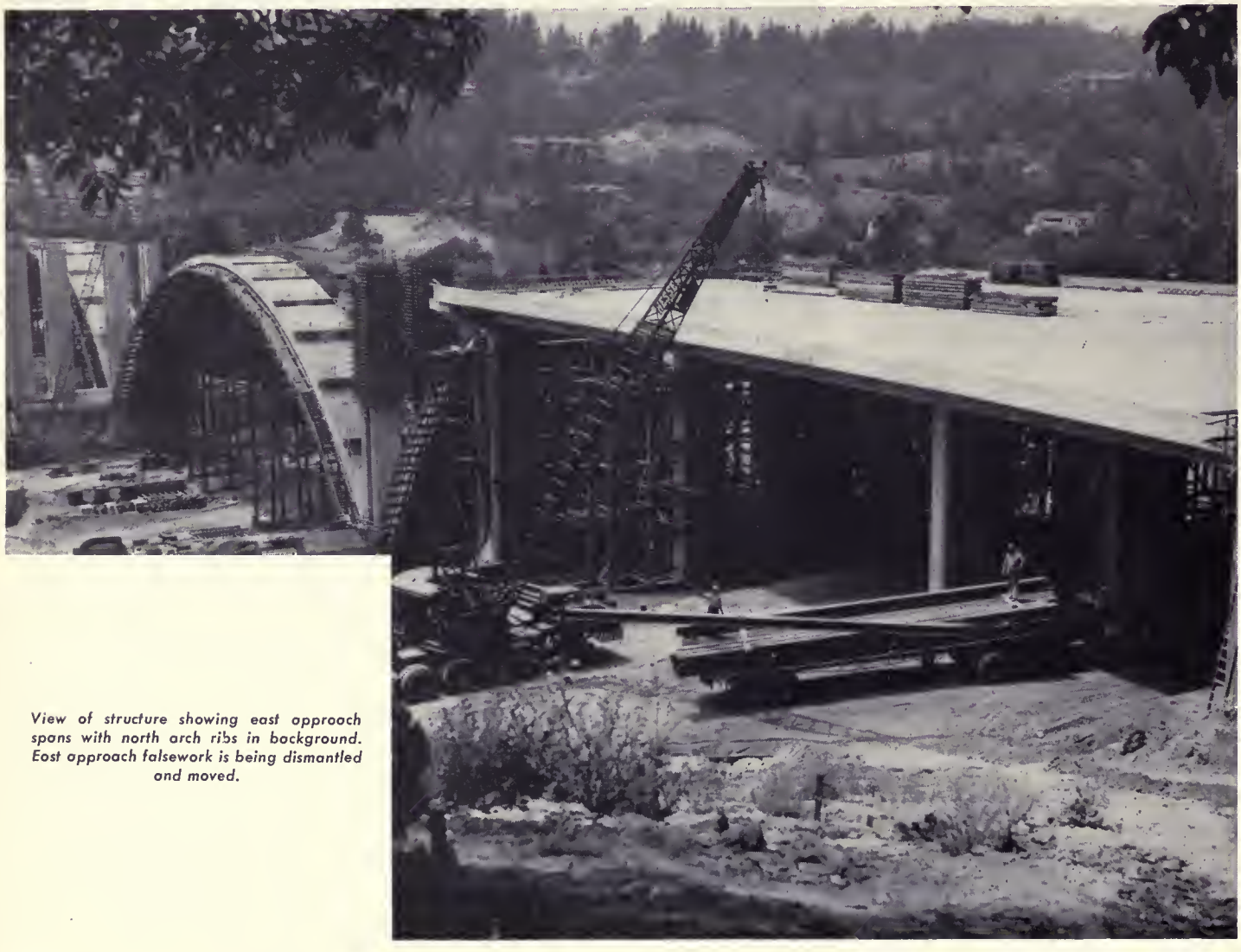
Design Fully Adequate

In general the results of these measurements indicated that the falsework design was fully adequate. Settlements in the soffit due to deflection of the I-beams and compression in the tower legs reached a maximum of 1¼ inches, within one-eighth inch of the predicted amount. Lateral movement at the tops of the towers never exceeded three-eighths inch and fluctuated in a manner that indicated temperature changes as the primary cause. Results of the strain gage readings showed that the concrete load of each section placed was carried almost entirely by its adjacent towers, i.e., there was no appreciable shifting of the load into the far towers.

After the "key" sections of the arch were poured a curing period of 21 days was required before the centering could be lowered. This allowed the concrete to acquire its design strength of 3,200 pounds per square inch.

Lowering Operations

Lowering operations began with chipping out the grout pads between the column bases and the concrete footings. Attempts were then made to lower the towers by means of the 2-inch screw jacks alone. This proved impracticable because of the difficulty in keeping the load on each leg evenly distributed among the four jacks with the result that the jacks would freeze up. To alleviate this situation, knee brackets were welded on the outside corner tower legs. Under each of these brackets a 100-ton hydraulic jack was placed to carry the load while the screw jacks were being lowered. Jacks had to be lowered approximately two inches before all the plywood soffit had broken loose from the concrete. The towers were then lowered an additional two inches until the two lateral steel "skid beams" rested on 4 x 12 greased planks. Meanwhile, greased skidways had been constructed joining the north rib falsework footings to the south rib footings.



View of structure showing east approach spans with north arch ribs in background. East approach falsework is being dismantled and moved.



Over-all view of arch centering after completion of north arch rib. Entire falsework will be skidded as a unit onto adjacent footing pads for use in construction of south arch rib. Note skidways joining north and south footings. Picture also shows the extensive safety measures taken by construction of access stairs and walkways. Space between 36-inch I-beams spanning between towers was covered with planking to insure safety of workmen.

Method of Moving

Actual moving of the centering was accomplished as follows: For each tower two sets of six-part nine-sixteenths-inch cables were strung between pulleys fixed at one end to pile cut-offs used as "dead men" and at the other end to the tower leg. The free end of each cable was wound on a winch fixed to the tower leg. A gear ratio of 24 to 1 on the winches with six runs of cable netted a mechanical advantage of 144 to 1, thus enabling the winches to be operated by hand. In this way careful control could be exercised over the relative movement of the towers. This was essential inasmuch as the entire centering had to swing on an arc as well as move laterally due to a divergence of the two ribs.

At the time of this writing the movement of the first span had not yet been completed. Thus far the tendency has been for tension to build up in the cables as they are drawn in and then for the towers to move suddenly a distance of from two to three inches. On reaching the south footings the towers will be jacketed up by means of the same hydraulic jacks described previously. The top of the superstructure will then have to be partially stripped and built up again with new blocking and camber strips to the grade and alignment of the south rib.

F. W. Panhorst, Assistant State Highway Engineer (Bridges), is in charge of the design and construction of this project. Local administration of the State's contract with Guy F. Atkinson Company is under the general supervision of J. W. Green, Southern Representative for the Bridge Department. H. R. Lendecke is the Resident Engineer for the Division of Highways. W. T. Colwell of Guy F. Atkinson Company was in charge of the falsework design while R. K. Boyd, project manager for the contractor, was in charge of its erection.

THE PENINSULA

Do you know the correct name of the peninsula on which the City of San Francisco is located?

The California Section of the State Library reports that from 1869 until 1950 the peninsula was known as the San Francisco Peninsula. In 1950 an attempt was made to change the name to the Santa Cruz Peninsula.

When considerable opposition developed a U. S. Commission on Geographical Names adopted the name "The Peninsula" for official use on maps and other purposes.

In Orange County

First Section of F.A.S. Arterial Highway to Beach Completed

By H. SPRENGER, Road Commissioner, Orange County

One of the most heavily congested routes of the state system in Orange County is U. S. 101, Alternate, or Coast Boulevard as it is known locally. This congestion spreads with diminishing intensity to the lateral roads which feed the coastal route. Harbor Boulevard, a county road, F. A. S. Route 742, which feeds into Newport Beach through Costa Mesa, and Huntington Beach Boulevard, F. A. S. Route 627, a state highway, are among the feeder routes most affected.

These feeder roads are taxed to their capacity on days of "good" beach weather. They parallel each other and are four miles apart. It has always been the contention of Orange County that if there were more of these arterial routes to the coast, the traveling public could select the route which would bring it closest to its destination on the coast and thus reduce travel along the coast. A further effect of additional routes would, of course, be to reduce traffic on existing feeder routes.

The Wright-Brookhurst Route (F. A. S. Route 747), just completed, seemed an ideal one for relieving the present congestion on two of the main feeder routes of this county to the coast since it lies midway between these routes, and it will, when completed, traverse the entire distance from the new freeway (the Santa Ana Parkway) to the Pacific Ocean.

Corridor County

Orange County may be termed a "corridor" county inasmuch as traffic through it originates in the large densely populated districts of the Los Angeles metropolitan area which lies outside the county. In point of time, these districts have moved, in some instances, hours closer to the beach recreational areas through the construction of the Santa Ana Parkway. While the "farm to market" and small local community service of F. A. S. construction are important, neither purpose can be fully accomplished as long as local county roads are used by this "through" traffic seeking to avoid the congested state system. Wright-Brookhurst is but a single move in an over-all scheme which will ultimately be needed to completely solve the county's traffic problems.

The economy of the territory served is as varied and mixed as any in this county. Along the southerly portion are many producing oil wells. Here also are to be found the famous bean lands of this county, which account for the production of a substantial portion of all the limas produced in the Country. Along the northerly section of the route are hundreds of acres of the world famous valencia orange groves. Lying between these districts, and scattered through them to some

Looking southerly along Wright Street toward intersection of Bolsa Avenue.





Upper—Looking northerly along Brookhurst Street, showing grade crossing with Southern Pacific Railroad branch line to Anaheim. Lower—Looking northerly along Brookhurst Street toward Cerritos Avenue intersection.



extent, are many acres devoted to alfalfa, truck farming, permanent pasture and cattle feeding lots, dairies, poultry and rabbits.

Economy Being Changed

Slowly at first but now at a more accelerated rate the economy of this farming area is being changed by the tremendous population growth of Southern California. The orderly development of residential areas which now accompanies real estate subdivisions is to be found with increasing frequency in the area served by the route, along with the scattered clusters of older homes and "acre" places of several years ago. The improvement does not serve any large community along the 8.86 miles which it now traverses but many experienced observers believe that much of the area may eventually be transformed into an unbroken residential section.

In this project no unusually difficult problems were encountered either in design or construction. However, what is considered a design innovation of this county in two-lane construction was introduced into the Wright-Brookhurst project. Our standard design for the primary and F. A. S. systems consists of a traveled way of two 12-foot lanes surfaced with from two to three inches of plant-mix asphalt; shoulders are eight feet in width and surfaced with road oil mix of native material. Since it was believed that the

. . . Continued on page 43

ROADS—AND THE RIGHT OF WAY DEPARTMENT

By EARLE R. BUNKER, District Right of Way Agent

PREFACE

We are builders of roads. We are shapers of destiny, for the stories of roads are the stories of history. Sandy roads, muddy roads, roads of stone, cobblestone, asphalt, concrete; straight roads and crooked; bad roads and good roads.

A hundred thousand slaves rolled huge stones over hot, sandy roads to build the north-peering pyramids and caravans laden with silks and other precious things filed westward across the forbidding Gobi to Bagdad and Allepo. A Macedonian carved roads and empires from the Hellespont to the Indies and One who was lonely and heavily laden heroically trod a cobbled road to a place called Golgotha. Paved roads echoed to the tread of conquering legions, and in turn to the padded footsteps of their barbarian conquerors spewing out of the forbidding north; and a virgin, with a fortune in gold and jewels, could travel alone and unmolested over the road of the Great Kahn that stretched over a thousand miles across the steppes.

The sparks that flew from flying hooves on the road to Concord and Lexington lighted the fire from which was forged a great nation; and a tumbrel, rumbling over cold and hopeless cobblestones carried a bewildered queen to her doom. An humble priest lovingly placed his missions under smiling skies along El Camino Real that skirted the western sea and in the muddy and bloody roads of the Wilderness a cause was lost. Beyond the Father of Waters the plodding covered wagons marked the fertile plains with roads that heralded the approach of an empire and the crack of a scout's rifle from a sand spit in the Arickaree toppled the chief who led the last, futile charge to stop those encroaching roads.

Yes, history is woven with the woof and warp of roads. Roads that for centuries have slowly and inexorably extended westward across three continents. Along these roads empires have risen and fallen. Whatever story is told, whether this idea or that wins or loses, the surge of mankind from East to West has never stopped. The setting sun has beckoned man across rivers, deserts and oceans from the beginning of time.

THE WEST

We now are at the shore of the western sea. Civilization, as we are pleased to call it, has circled the globe. The sun in the West still calls—but to what? Another continent thousands of miles away across the vast Pacific—a continent teeming with races whose beginnings are lost in antiquity. There are no new lands to the west to explore and populate.

The westward urge will move man from the old East to the new West until the latter, too, becomes old. The physicists apply the theory of equipartition of energy to molecules and universes. It also applies to man. Unless some catastrophe intervenes the race of man will move westward until it can move no further. It will then distribute itself more or less equally over the face of the earth. But that is too far away in time to consider; we are concerned with roads.

CALIFORNIA

The rutted wheel tracks of the covered wagon scarred the level plains and ground hazardous routes through mountain passes. They were made and remade across shifting sands of heartbreaking deserts. The explorer and the scout and the trapper led the way.

Thousands, then tens and hundreds of thousands followed. Villages, towns and cities sprung into being. These haphazard roads had to suffice until the railroad started moving west from the Atlantic seaboard.

The 1850 census of California was about 100,000 persons, a surprising percentage of which were those "ladies of easy virtue" that were naively identified by the Spanish appellation of "mala vida."

The engineer took over from the scout and the trapper. He tied this sprawling, expanding empire together with railroads and telegraph. He built them through forbidding mountain ranges, over seemingly impassable rivers, canyons and deserts. Through roads for horse-drawn vehicles became secondary in importance. They appealed only to the occasional adventurous soul. Every railroad station became a focal point for the wagon roads that radiated out to the homesteads of the newly arriving settlers. As the country became more populated, the farmers might harrow and drag the road a couple of times a year. This for their and their neighbor's occasional trips "to town." Perhaps, too, they might realize a slight return by way of credit on taxes due. If farmers' or cattlemen's journey was of any length, they would leave the team in the livery stable in town and take the train. That would be a red-letter day, long remembered and discussed.

At the turn of the century California had grown to a million and a half! Two million more came in the next 20 years.

ERA OF AUTOMOBILE

Came the automobile. Its rapid acceptance and development produced the most profound economic development since the advent of steam power. No longer was the individual limited to "hay burners" and train schedules. With an auto, one could go anywhere—if there was a road! The more the demand grew for autos, the greater was the clamor for more roads—through roads—good roads. This demand and clamor have never been met or satisfied.

The engineer was called again. Bonds were voted, 18 million dollars, an enormous sum—but it wasn't quite enough. Then 12 million more (this would surely finish the program!). Then 40 million more were voted! With this money, the engineer graded and drained existing roads. He built bridges and culverts. Some roads were oiled, some paved, and what wonderful roads! The best were concrete—15 feet wide and four inches thick. They had a minimum radius of 40 feet on center line. Some had superelevation that permitted them to be traveled at full

speed—40 miles an hour! The engineer's work would be finished, except for maintenance, when this network was completed. We would have all the roads we would ever need—so we all thought.

Road Was the Thing

Everybody wanted roads, so who cared if that fence had to be moved back a bit or if the contractor needed some sand out of that hill off there a ways through that field? Sometimes, perhaps, the engineer would pick up a few blank deeds at the local emporium and have them signed by the residents as he went along with his work. Seldom was he challenged for invading someone's property rights. After all, the road was the thing.

In the two decades after 1920 the population of California increased by 3,700,000. In the next 10 years it increased very nearly that same amount. The westward urge of the centuries continues, not only unabated but augmented.

The motor car changed from a luxury or a convenience to a necessity. Mild winters permitted year-round use of motor vehicles. Phenomenon piled on phenomenon with bewildering rapidity. People kept coming to California. The percentage of motor vehicles to population grew daily. Farmers, manufacturers, merchants, in fact nearly every commercial enterprise found use for cars and trucks.

What a Change

But the roads? The engineer had not finished his job as he had anticipated. When the bond money was expended, a tax on gasoline was put into effect. The roads that had been built for convenience and sightseeing became arteries of commerce in addition. They had to be widened and straightened.

The next phenomenon was the most painful—every road that the engineer had built was dotted with towns, villages, cities; the open road was lined with gasoline stations, restaurants, motels (a phenomenon in itself), markets, and countless, endless merchants of this and that, all hopefully pleading for the travelers' dollar, all intertangled with signs, and billboards, big and little, entreating, crying, imploring and directing to here and there and all hopelessly snarling and confusing and slowing the ever-increasing traffic.

Problems Increase

No longer could the engineer move the fence back and widen the road. He had to move buildings, gas stations, and all the multifarious enterprises and mare's-nests that cluttered the roadside. He found that every structure, Class A or maverick, was a gold mine (potential, of course) and to his amazement almost every foot of lush alfalfa patch or barren alkali flat was, by some mysterious transmutation, "business frontage," according to the owner. The engineer found that the widening and straightening of a road was not confined to design and construction costs, but in addition it was necessary to buy property and move improvements that were in the way. He tried entirely new alignment of some roads only to find that the ubiquitous roadside development inevitably and immediately followed.

Because of their small value in comparison to the benefits and convenience of a road, property rights had long been quiescent but now the story was different. The complexity of these rights and the difficulty of evaluating them plus the indeterminacy of human behavior were matters foreign to the engineer. He solved the problem by turning that work over to trained agents. So there came into being the Right of Way Department.

THE RIGHT OF WAY DEPARTMENT

The Right of Way Department grew slowly. In an engineering organization, the advent of this new department was generally viewed as the third handle on a wheelbarrow would be. It became one of the few havens for political payoffs in the rising tide of civil service reform. A politician just couldn't design and build roads, but anybody could be a right of way agent.

Then came the first forward step: the department was placed under civil service. The unfit and inept fell by the wayside. On the other hand the organization is today dotted with agents rating high in ability, authority and esteem, who started as political appointees. In fact, the department owes its present organization and effectiveness to the aggressiveness and untiring effort of its chief who started with an obscure (but not for long) political appointment as right-of-way agent.

AGE OF FREEWAYS

The next milestone reached was the development and expanding of freeways. Not only right of way was affected, but the entire concept of public roads was fundamentally altered. Main roads were to be built to serve traffic, not abutting property. The engineer, who might have admitted that the Right of Way Department had graduated from the "third-handle" class to that of "necessary evil," now recognized a full partnership. He couldn't build roads until the right of way was clear and often couldn't even design them until right-of-way cost analysis determined the most economic location. Many joint studies had to be made to determine a location that would balance traffic requirements and construction and right-of-way costs against allotted funds.

Right-of-way costs pyramided from a relatively few thousands of dollars a year to tens of millions a year. Right-of-way costs now absorb about one-third of the total sum allotted for new construction and are greater than total state highway expenditures in most states. And the demand for new and better roads is far from being met, much less satisfied.

ADDITIONAL PERSONNEL

This huge increase in expenditures required a proportional increase in personnel—not just anybody—trained men were needed. There weren't any. So the next forward step was made. A civil service classification of junior real property agent was set up, the only requirement being graduation from college. The written examination was basically an aptitude test and the oral interview served to screen out all those who did not have the necessary physical and personal characteristics essential to the successful right-of-way agent. At the conclusion of World War II, a particularly virile group of these beginners were attracted. They were hired and put through educational training courses where they learned to use the tools of the profession. This program has been eminently successful. This group now comprises the major part of the right-of-way personnel. They are young, aggressive, and fascinated by the work, by the diversity of knowledge they must have

and by the ingenuity required to solve abstract problems of property rights and personalities. As time goes on more and more of the responsibilities of the Right of Way Department will fall on their capable and willing shoulders.

RESPONSIBILITIES

The work of the Right of Way Department is twofold. It is our job to see that the necessary lands and rights are available when required for construction of highway projects. Equally important, we are charged with the responsibility of seeing that the rights of the property owners and the State are equally protected. Inexorably woven into this task is the field of public relations. The property owner we deal with has probably his first and only direct contact with the State. When the transaction is complete, his opinion, good or bad, will be evinced in his words and actions. His experience with one state department can easily influence his opinion on all state offices. It is therefore incumbent upon us to conduct ourselves accordingly. We must use the tools of our profession carefully, reasonably and equitably.

MANY TOOLS OF PROFESSION

There are many tools of our profession; the Constitutions of the United States and of the State of California are the first. Then come the laws of the Legislature, the Civil Code, the Code of Civil Procedure, the codes relating to highways, various related laws pertaining to taxation and governmental procedures. Then there are the decisions of the courts applying and interpreting these laws. There are the laws and procedures relating to real property, its transfer, encumbrancing, estates, divorces, trusts, et cetera. There are the policies and procedures of the Department of Public Works, the Highway Commission, the Director of Public Works and the State Highway Engineer. There are the matters of highway financing, programs, projects, surveys, maps, plans, studies, public utilities, construction and maintenance methods and procedures. There are techniques of appraising, psychology, public relations, salesmanship.

To do our work properly, we must have a fundamental, workable knowledge of these subjects. We must continually study and use all of these tools. Superficiality will not do. When we couple this knowledge with sound experience we are right-of-way agents.

A SELLING JOB

The last tool of salesmanship is probably the most effective of all. It is here we weld knowledge with accomplishment. While we buy properties, we are not purchasing agents. We are salesmen. We must, first, be sold on our work so that we, in turn, can sell it to others.

We must sell the public generally and the property owner specifically on the State Highway System, on the safety, efficiency, and necessity of the roads we are building.

We must sell the property owner on the particular improvement planned, its necessity and the betterment that it embodies as a part of the highway system. He should be shown the plans and profiles and should receive an explanation as to the necessity of the various features.

We should show the owner how his property is affected, both as to alignment and grade; if access is taken, the way we have planned to provide or substitute other access. The owner must be made to understand the full import of what the taking of access means. He should be fully informed as to any detriment his property suffers, as well as to any benefits that accrue to it.

RELATIONS WITH LANDOWNER

We should discuss with the owner all his problems, frankly and thoroughly. We should use our experience and ingenuity to satisfactorily solve these problems. He should be fully informed as to what items are compensable and what are noncompensable. We should advise the owners of the legal obligations, requirements, and procedures, and the method of reaching value by means of an appraisal should be thoroughly discussed.

When the owner and the State are mutually informed as to each other's requirements and as to the effect on the owner's property, we are then in a position to make a sound, equitable offer. This offer is based on the appraisal, together with any modifications or requirements that are justified from the discussions. We should always keep in view the basic concept of "just compensation." This applies with equal force to both parties, the State and the owner. The State is required to pay on the basis of market value, no more, no less. The completed transaction should conclusively exhibit that that condition has been fulfilled.

JUST SETTLEMENTS

We realize that our tools are not keen. For example, the personal equation of either the agent or property owner cannot be evaluated so their actions and reactions can be predetermined. We do know, however, from long experience and sincere effort that the indeterminacies and inaccuracies of our tools do produce a workable, practical method of acquiring property. The end result, in the vast majority of cases, is a just settlement between the State and the citizen.

And so we acquire property. We believe that we are doing a good job, for out of each 100 parcels acquired last year, less than five were obtained by condemnation. This includes friendly condemnations against cities, counties and other public agencies where charters require eminent domain proceedings. Also included are stipulated judgments where the State and the property owners reach an agreement after the action is at issue. The property is turned over to the engineer that he may build roads that were not even dreamed of a generation ago! Roads that the millions of people here now and the millions to come will travel, we hope, happily, expeditiously and safely.

We cannot foretell the future. We do know that when we build roads we are building the framework of history, but only time will reveal the completed structure. We can only hope that the roads we are building will add to the happiness and progress of the generations that follow.

LOOKING AHEAD

Driving an automobile is something like playing chess; you have to plot your movements ahead of time if you want to avoid trouble. But driving also requires instantaneous decisions and constant alertness.

New Bridge Over Stanislaus River at Melones to Be Constructed



This drawing by the Bridge Department of the California Division of Highways shows how the planned new Stanislaus River bridge at Melones will look to the motorist traveling northwest from Sonora. The settlement of Melones is at the far end of the bridge, where the Golden Chain Highway (Sign Route 49) starts its climb over Carson Hill toward Angels Camp. Abutments of the former bridge, which was built in 1911 and collapsed January 25, 1952, may be seen upstream from the proposed new structure. The two main spans of the new bridge measure 115 feet each. It will have a total length of 365 feet, about 65 feet longer than its predecessor, and will have a roadway 26 feet wide between curbs, instead of the former 18 feet.

THE NEW bridge over the Stanislaus River at Melones will be located about 125 feet downstream from the 30-year-old structure which collapsed last January, and will be of reinforced concrete box girder construction, longer and wider than the old bridge.

Plans for the new bridge have been completed by the State Division of Highways, and bids have been called.

The new downstream location will permit straighter approaches, according to engineers of the Division of Highways. The roadway will be 26 feet wide between curbs, instead of the 18-foot width of the deck on the old bridge. The new bridge will be about 65 feet longer than the old, and its deck will be several feet higher above the river.

Since the old bridge collapsed, traffic between Angels Camp and Sonora has used a detour over county roads and the Parrott's Ferry Bridge, about two and a half miles longer than the state highway (Sign Route 49) route. The detour will continue in use during construction of the new bridge and approaches, and will continue to be maintained by the Division of Highways.

In Orange County

Continued from page 39 . . .

eventual traffic load would exceed the capacity of this design and thus necessitate widening, consideration was given to future widening costs in the preparation of the initial design. It was decided that instead of constructing a shoulder inferior to the traveled way, uniform base and surface material would be used under the entire roadway width of 40 feet. Thus no part of the present improved width would be disturbed by a widening project. Not only did state and federal representatives approve this design for Wright-Brookhurst but they recommended that it be incorporated in the design for the next F. A. S. project which roughly parallels, some four miles easterly, a portion of the Wright-Brookhurst route to the coast.

Thanks are due to all of the state representatives who worked so closely in cooperation with the county to bring the project to a successful conclusion. Day by day handling of the plans and construction engineering was left to county personnel, and its cost was paid from county funds. In this connection, however, the county used its own testing laboratory exclusively in making the tests required. Thus it is the first F. A. S. job for which this can be said. The economics effected are sufficient, on the whole, we believe, to justify the cost of establishing the laboratory.

GOOD DRIVERS

The best automobile drivers are those who drive in a relaxed position, at a moderate speed, with the car always in perfect control. The California State Automobile Association points out that excessive speed can be a highway menace. Take it easy—you'll get there almost as fast, without regrets.

AVOID SPEEDING TO APPOINTMENT

Whether you are driving recklessly just for the thrill of it or to get to an appointment on time, one slight mistake will bring disaster. Before speeding to make an appointment, remind yourself that it is better to arrive a little late than not to arrive at all.

Early Days

Minutes of First Highway Commission In 1911 Make Interesting Reading

By R. C. (CASS) KENNEDY, Secretary, California Highway Commission

THE EDITOR of this magazine started me on this idea of looking up historical data in the original minutes of the California Highway Commission. He asked me one day if at any time the commission had adopted a brand, or a mark, to be placed on property belonging to the California Highway Commission. In delving through the old records, I got very interested in a lot of things that were done when the act creating the California Highway Commission went into effect.

Looking up historical data is always fascinating. You run across so many things that were done in such a manner so different from what we are doing today. You think of all the difficulties our forefathers had in bringing civilization to its present state of development; difficulties which we would call difficulties today were nothing to the men of the former generations. They had no up-to-date machinery—"Up-to-date," as we call it today—and they went ahead and did things, accepted things, adopted rules and regulations that still stand, and yet we wonder how they did it.

Commission Created

In 1911, there was an advisory board to the Engineering Department of the State of California. The State Engineer was Nathaniel Ellery, and three members of this Advisory Board were appointed, under laws passed by the State Legislature, to form the first California Highway Commission. They worked under a resolution which was adopted by the Advisory Board of the Engineering Department, as follows:

"*Resolved*, That the appointed members of this board, to wit: Messrs. Charles D. Blaney, Burton A. Towne, and N. D. Darlington, be, and they are hereby appointed a committee to be known and designated as the California Highway Commission, with the jurisdiction and powers following, to wit:



Austin B. Fletcher, first California State Highway Engineer.

(1) To take charge of the entire matter of the construction and acquisition of a system of state highways in and for the State, as and in the manner provided by law, at a cost not to exceed the sum of $18,000,000, under and in pursuance of the act of the Legislature of the State of California, approved March 22nd, 1909, and known as the State Highway Act, and to do and perform as fully and completely as may be done by any part, or representative, or committee of this Advisory Board, every act and thing that may be requisite to be done and performed in connection with the highways of the State of California, or that ought to be done and performed under the said State Highway Act.

(2) To do and perform every act and thing in and about the premises that a committee of this board may be lawfully authorized to do for and on behalf of this board; and to have full charge and control of the acquisition and construction of the laying out and building of a system of such highways.

(3) To report from time to time to this board their actions and proceedings and to submit to this board for determination such matters as the law requires this board to act upon; and to superintend the work and operations of the highway engineer whose appointment is provided for by the act of the Legislature of the State of California, approved April 8th, 1911.

(4) To perfect such organization as they may deem necessary to carry on with celerity and efficiency the work to be done in the matter of acquisition and construction of the said system of state highways, and under the said State Highway Act; and generally to do all and singular every act and thing that may be necessary for the due, speedy and efficient performance of all that may be required under the said State Highway Act, and under the said act of the Legislature of the State of California, approved April 8th, 1911."

First Meeting

The first meeting of the California Highway Commission was held in Sacramento on August 9, 1911. The three members of the committee met on that day with Charles D. Blaney acting as temporary chairman. On a motion by Mr. Towne, seconded by Mr. Darlington, W. R. Ellis was chosen secretary of the commission. Again, on a motion of Mr. Blaney, seconded by Mr. Darlington, Burton A. Towne was duly elected chairman. The commission was told by George Radcliffe, who was the Superintendent of the State Capitol Building, that they had been assigned Room 118 in the State Capitol Building as a temporary office. Then, without going into a lot of typewritten record, it merely states that a discussion of the statutes relating to the duties and functions of the Advisory Board of the State Engineering Department was held and the commission held a conference with His Excellency Hiram W. Johnson, Governor. The commission adjourned subject to the call of the chairman.

Nine days elapsed before the commission met again on August 18th. At that time, Mrs. A. L. Harrison was elected stenographer for the commission. The matter of addressing letters to boards of supervisors, civic bodies, automobile clubs, and newspapers, was informally discussed, but no further business appearing, the commission adjourned.

Second Meeting

On August 21st the commissioners met again in Sacramento and went over the initial minutes of the commission, and then proposed that a letter be sent to all boards of supervisors by the commission, asking for certain information. And they discussed another letter to be sent to boards of trade, chambers of commerce, automobile clubs, newspapers, etc., and finally decided upon the type of letter to be sent to all the boards of supervisors of all the different counties in the State.

There seem to be no records in Sacramento regarding which was the best road and which was the best way to get from one town to another, so the commission asked all of the supervisors to send a complete map of their respective counties, drawn to a scale of one-half inch to the mile, and indicate thereon the route, or routes, most desired for such a highway system. And would they furnish all the additional data of the population and assessed value of all towns, and other data valuable under the circumstances. The commission also sent a copy of this letter to all the various civic bodies and newspapers in the State, and, nothing else to be done, it again adjourned.

Letters to Press

On September 7th, the commission had decided upon the form of letters and it instructed the secretary to have prepared, at once, letters to all newspaper editors in California, and enclosed therewith a copy of the letter to the different boards of supervisors already agreed upon, and, according to the minutes, that is all that was done on September 7th.

On September 8th, the commissioners met again and talked of the minutes that had preceded to see that they were in correct order, and then they ordered themselves to go into a session with the Attorney General in accordance with an appointment made with him. By this time, A. B. Fletcher of San Diego had been appointed Highway Engineer. Mr. Fletcher and the secretary were directed to draw up forms of applications for positions under this commission and to have the same printed in the proper manner and in sufficient quantities; and the secretary was informed that he must send these applications to all the applicants, with a proper letter of instruction.



R. M. Morton, who succeeded Mr. Fletcher as State Highway Engineer.

The commission decided that it should subscribe to *Good Roads*, *Better Roads*, *Engineering Record* of New York, and *Engineering News* of New York, and adjourned to 2.30 p.m. It met again that afternoon and had a rather informal discussion regarding the location of permanent offices. It decided to meet with the Attorney General on September 13th, and at 5 o'clock p.m. adjourned.

Seek Larger Quarters

On September 9th, the commissioners again met at 11 o'clock a.m. and had decided that the quarters assigned them in the Capitol Building were much too small for their growing organization, and passed a resolution that the headquarters should be in San Francisco. Inasmuch as they also wanted to see the Governor, they made a date to see him that afternoon at 2 o'clock, and it was so ordered and an adjournment was then taken until that time. At 2 o'clock that afternoon Mr. Fletcher, the Highway Engineer, and all members of the commission met in conference with His Excellency, Governor Johnson. They talked about this resolution that they had passed that morning regarding the removal of their offices to San Francisco, and it was submitted to the Governor. At his suggestion the secretary was instructed to write a letter to the Attorney General to find out if these things could be done legally. To get further weight behind them, they decided that they should meet with the entire Advisory Board and the Governor in the Executive Chambers on September 14th, so the secretary was directed to make such arrangements and to notify the several members of the Advisory Board, the Board of Control, the State Controller, and the State Treasurer, and they adjourned.

Meet With Governor

On September 14th, they met in the Executive Chambers with the Governor, and with the other members of the Advisory Board of the Department of Engineering. Governor Johnson; State Engineer N. Ellery; President of the Lunacy Commission, Dr. F. H. Hatch; the honorable Board of Control; State Treasurer Edward Roberts; State Controller A. B. Nye; and Highway Engineer Fletcher, were present, along with the members of the commission. State Controller A. B. Nye proposed a resolution that they should sell $400,000 worth of state highway bonds as authorized by the act of the Legislature and approved by a majority vote of the electors at an election held on November 6, 1910. This motion was duly seconded and passed and is made a part of the records.

The Governor then read the resolution adopted by the commission on September 9th regarding the establishment of the headquarters of the commission in San Francisco. A discussion ensued—so says the record. It seems by that time everybody had changed his mind and everybody was against the contemplated removal to San Francisco, and thought that the commission headquarters should stay in the State Capitol. So that afternoon the commission met again and rescinded the motion of a previous meeting and decided that headquarters would remain in Sacramento.

Buy Automobile

There were a couple of other meetings at which apparently not very much was done, but on September 26th the commissioners had reached the point where they thought they should have an automobile. So by unanimous agreement it was resolved to purchase a Locomobile automobile.

This was of the seven-passenger, six-cylinder type, equipped, for the gross sum of $5,000, delivered in Sacramento.

And again the matter of procuring permanent offices was taken up, and it was decided to communicate with the Forum Investment Company, owners of the Forum Building in Sacramento, regarding office space.

On September 27th, Mr. Fletcher, the Highway Engineer, submitted a memorandum about the early work of the commission and cited the different statutes that made it a legal body, and then proceeded to make a number of suggestions. One was about the "board" meetings (he probably meant the Highway Commission meetings) and about preliminary inspection trips. He also had a suggestion as to the form of organization and the duties of the Highway Engineer and the secretary. Mr. Fletcher also put in for what he thought would be a sufficient office force for the headquarters, and also suggested a nucleus of the force of each division office.

There was also the question of legal advice. Mr. Fletcher wanted a right-of-way attorney employed as soon as possible so that as soon as they began taking over roads the matters of rights of way could be cleared; and he also suggested that a number of geologists be employed to look up the information concerning deposits of road materials and oil wells. The last of the suggestions was for a standardization of forms, or rules, for the matter of building highways, such as widths of rights of way, grades, minimum radius, etc.

Highway Districts

Part of Mr. Fletcher's idea was that the State should be divided into at least seven divisions. He stated that the location of these offices should be chosen very carefully, since they should also serve as maintenance offices for the future. Then he suggested that one division office might be established at once in the headquarters of the commission at Sacramento. The commission approved all of the ideas, and adjourned.

On December 6, 1911, the first delegation appeared before the California Highway Commission. The present commission can look back and find out that the idea of holding formal meetings, or open meetings, started a long, long time ago, for on this date a Solano County group appeared and submitted maps and solicited an appointment by the commission to visit Solano County and to inspect their proposed routes.



C. C. Carletan, first attorney for the California Highway Commission.

Public Hearings

This idea of appearing before the California Highway Commission still prevails, and on a Thursday morning, usually the third Thursday in each month, the commission holds what it calls a public hearing in which anybody is welcome to come before it and lay their problems before the commission. Groups which wish to appear before the commission are asked to write for an appointment and to tell why they wish to appear or what matter they wish to take up, so that ample time can be assigned them for their appearance on these mornings.

On December 7, 1911, the first legislator appeared before the commission on state highway matters. The minutes show that Senator Chandler appeared that day. The minutes do not show what he talked about, nor what county he was representing. (He was from Fresno County.)

The commissioners decided that various furniture dealers be notified to submit bids for furniture for use in their new offices in the Forum Building, and on that date voted that Charles C. Carleton, an attorney, be hired for the sum of $2,500 per year, beginning November 10, 1911, to serve at the pleasure of the commission, and the same was thereby ratified.

Mr. Carleton retired as head of the Division of Contracts and Rights of Way of the Department of Public Works on March 1, 1949, after 38 years of continuous service as an attorney for the highway end of the State of California.

Well, you can see that by this time the commission was really getting into stride. It had a highway engineer. It had a secretary to the commission. It had a stenographer. It had hired a lawyer, and it had adopted a resolution that it should get $400,000 worth of bonds sold as quickly as possible.

Salaries Fixed

On the next day, the commission met again and on the recommendation of the Highway Engineer, it set up a tentative schedule of salaries for employees of the Highway Engineer's Department. A division engineer, which is akin to the present district engineer, had a salary of $250 a month, and it ranged down to where an axman was to get $50 a month. By this time several people had applied to the commission for employment, and the Highway Engineer was instructed to communicate with them and send them its form of application to see about their background and ability to hold a position.

Districts Established

On December 9th, the Highway Engineer presented a map entitled, "An Outline Map of California," and it showed the seven divisions which he had set up, with their headquarters. Division I was at Willits (it is now Eureka); Division II was at Redding (it is still there); Division III was at Sacramento (this was changed to Marysville, when Division X at Stockton was established to ease the work on one of the larger districts in the State); Division IV was set up in San Francisco, Division V at San Luis Obispo, Division VI at Fresno, and Division

VII at Los Angeles, and they are all still in those locations. Since that time, four new districts have been added. District VIII is at San Bernardino; District IX at Bishop; District X at Stockton; and District XI is at San Diego.

It would seem that the first choice of the Highway Engineer didn't turn out so far wrong. Over the years, and with the growth of the Highway System of the State of California, it was found that the districts as originally set up were quite too large for one district and that was the reason for the addition of the four extra districts.

By this time the commission was beginning to receive communications from good-road enthusiasts from all over the State. Records show that communications came from Sacramento, Los Angeles, Santa Cruz—well, from practically every place in the State. The secretary was instructed to reply to all of them saying that the commission would not be able, on account of the pressure of official duties, to comply with the various requests for hearings until the forepart of the next year.



This road in Sacramento County was typical of many which confranted the first California Highway Commission in 1911.

That afternoon the commission opened bids for the furniture for its new offices, and after looking over all of the bids, it decided that revised bids should be taken under advisement because they eliminated the item regarding rugs and carpets. This was done with the consent of all the bidders, and there were four of them, and that afternoon they voted in seven different men as division engineers.

This picture with title was used in early highway band issue campaign.



Really Getting Started

By this time four months had gone by, but the commission was making good progress toward its permanent organization. It had its seven district engineers, and had decided where the seven districts were going to be located, and were really beginning to function. Nine days later, on December 18th, it met again and approved all of the minutes that had gone before and read four more communications from different places regarding different things that pertained to the commission's work. The commission also ordered the secretary to make a contract with the Sunset Telephone Company for the installation of a telephone service in the new offices.

In the interim, the commission had gone to San Francisco, pursuant to resolution, and had examined the furniture tendered by the different furniture dealers, and also had called on W. J. Sloane Company at its San Francisco store regarding rugs. Also, on this date, the commission hired a Miss Helen Simonton of Berkeley as a stenographer to start in on January 1, 1912.

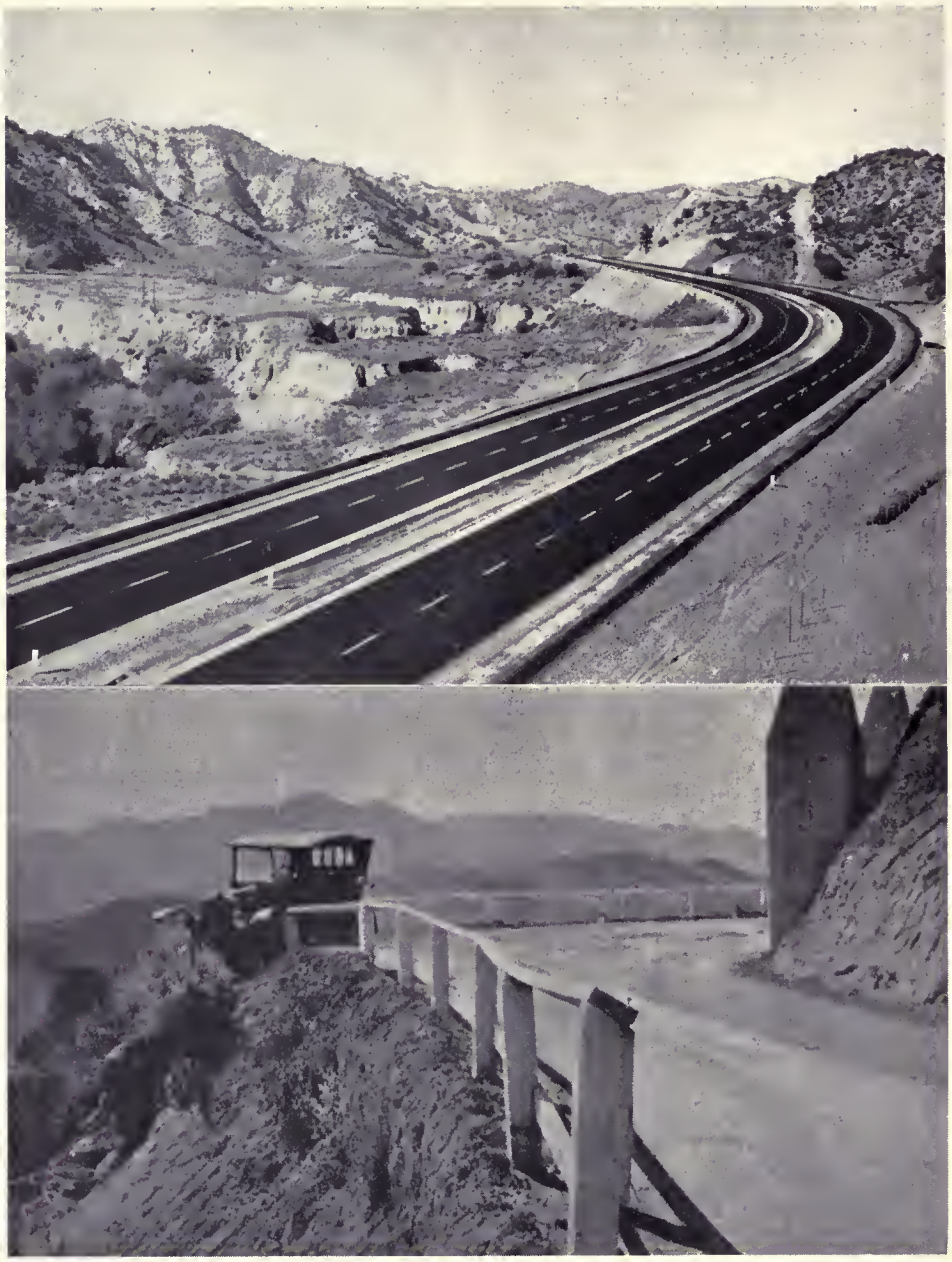
Geologists Employed

The next day, on December 19th, the commission decided to employ seven geologists to determine the location of deposits of road materials available for highway construction, and to report to the Highway Engineer. They suggested that Mr. Blaney, one of the commissioners, arrange with Dr. J. C. Branner for the selection of the seven geologists, and for them to appear before the commission early in January. It also was voted at that time that the Highway Engineer should have a secretary. This secretary was to investigate for the commission the cost and available supply of various materials, supplies, etc., and was to serve subject to the pleasure of the commission. On this date, the commissioners also asked the State Board of Control to allot $15,100 to pay the salaries of the different people the commission had hired, and the office rent and travel expenses, etc.

Locotion of Highway Routes

On December 20th the commission proceeded to consider, in executive session, the location of highway routes in various sections. Nothing is said in the minutes as to what routes were discussed, nor what decision had been reached. Recess was taken at noon and at 2 o'clock that day the commission met with the Advisory Board of the Department of Engineering. That meeting was evidently a little short, as at 3.30 p.m. the commission reconvened in regular session. On January 4, 1912, the commission decided that it should have an office in the Union Oil Building in Los Angeles, and Commissioner Darlington was empowered to make all arrangements necessary to secure four or five rooms on the ninth floor of that building. Commissioner Blaney was empowered to enter into an agreement with the owners of the Rialto Building in San Francisco for the lease of some rooms on the fifth floor to be used for the headquarters of Division No. 4.

On January 6th, a number of persons appeared before the commission. It seemed to be the start of a regular parade of people to Sacramento to talk to the commissioners either about positions or about roads. Most of these people who appeared on this date were geologists who had been recommended by Dr. Branner.



In the lower picture is shown a section of the Ridge Route, U. S. 99, before gas tax funds modernized this mountain highway as shown above.

Engineering Equipment

At this meeting the Highway Engineer was authorized to request bids for such engineering equipment as he should consider necessary for the office at headquarters and for the several division offices.

On that date also, the highway engineer was authorized to request bids for four automobiles—one to be delivered to each of the following division offices: San Francisco, San Luis Obispo, Fresno, and Los Angeles. It was specified that these were to be five-passenger cars, touring type, "each fully equipped with windshields, tops, B Presto-lite tank, Klaxon horns, Weed tire chains for all wheels, and four-inch tires all around, one extra casing, two extra inner tubes, one tire cover, and one set tire brackets."

. . . Continued on page 59

Late Fishing

Continued from page 29 . . .

division cannot take or allow others to take.

During normal years the Carson, Ebbetts and Sonora Pass routes have been cleared of snow between June 10th and 15th, with plowing operations getting under way around May 15th. Even with the snow pack down to normal this is no small chore, especially on the Carson Pass Highway where snow lies deeply drifted mile after mile and the side slopes are high and precipitous; and on Sonora Pass where the approaches to the summit are steep and winding.

Although it is the custom in years of normal snowfall to get the roads open as far as the fishing meccas of Lake Alpine and Silver or Twin Lakes by Memorial Day, highway crews say that it would be wishful thinking on the part of fishermen to expect these areas to be open by the start of the fishing season on May 30th this year. Most probable opening date will be around July 1st, unless a warm rain or unusually hot weather moves it ahead. In fact, if the weather turns uncooperative, as it has had a habit of doing this year, even getting some of these roads open by July 4th could prove to be a very difficult operation.

Problem of Plowing

Highway maintenance men point out that plowing hard-packed, deeply drifted snow at elevations ranging from 7,000 to 10,000 feet is entirely different from pushing aside the soft, flaky stuff that most people know. With temperatures hovering in the forties and fifties during the day and dropping to below freezing at night, plowing is a tough job; tough on equipment, tough on men and tough on highway maintenance budgets. The progress of the snowplow is like the action of a huge battering ram; a round of charging into the snow and ice until it can go no farther, retreating, waiting for a crew to set and explode a charge of dynamite, then ramming the the plow ahead once more. Often it is necessary to work large tractors with bulldozers on the top of the pack and ahead of the plows to break up the icy mass and shove it back to a rotary plow which then throws the loosened snow out of the roadway trench.

Although Mother Nature can, at times, be quite contrary, she can also help the snow removal crews. A continued period of mild weather, with a hot sun eating at the snow pack, can accomplish in a month a snow removal operation which could not in a similar length of time be completed with man-made equipment.

No Time Goined

Experience of the Division of Highways has shown that even if the wear and tear on equipment and the expenditure involved were disregarded, little or no time is gained in an early start. The snow-covered routes are kept under observation, and the equipment crews start work at the strategic time when only a few critical points require major clearing and only moderate depths remain over most of the routes.

In the relatively light snow year of 1941, for example, plowing on Carson and Ebbetts Pass highways started on May 19th. It required 38 working shifts of 12 hours each to open Carson Pass, and 22 shifts for Ebbetts Pass. The following year, despite a heavier pack of snow, the crews needed only nine shifts on Carson Pass and two on Ebbetts—simply because they started later, on June 16th. In 1941, it took them 11 days to reach Silver Lake on the Carson Pass Highway; with the later start in 1942, it took them only three days.

Cost Is Foctor

Cost-conscious engineers also point to the effect on the road surface of early plowing. A slightly later opening permits the highway to dry out more, and consequently to take less of a beating from the heavy snow removal equipment. Thus, early and expensive snowplow operation may mean more chuckholes later in the vacation season, and with less money in the depleted maintenance budget to make repairs.

A large proportion of highway maintenance men are enthusiastic fishermen themselves. They have observed that an abnormally heavy pack of snow means high water and resultant poor fishing early in the season. On the other hand, the angler who can bide his time until later in the season will find sustained water levels and good fishing, particularly if he is a fly devotee. And he benefits as a taxpayer, also, in receiving more value for his highway dollar.

In Memoriam

ROBERT L. WING

Robert L. Wing, Supervising Hydraulic Engineer, of the Division of Water Resources, died on April 3d at Indio where he was recuperating from an attack of virus influenza. He had resided at 2736 Curtis Way, Sacramento.

Wing graduated from Stanford University in 1921 and accepted an appointment as county engineer of Santa Clara County in that same year. From 1922 to 1924 he was assistant engineer for the Southern Pacific Company on construction of a second track over the Sierra Nevada. From 1924 to 1927, he was assistant engineer for the California Division of Engineering and Irrrigation, now the Division of Water Resources. For a period during 1928 and 1929 he was assistant engineer for the Orange County Flood Control District and from 1929 to the time of his death was with the Division of Water Resources, advancing from associate hydraulic engineer to supervising hydraulic engineer. He served most of his time in state service on investigations of water resources and more recently on the preparation of the California water plan. For several years he was the State's representative in cooperative work with the U. S. Geological Survey on the mapping of California.

Wing was born at Palo Alto September 10, 1896. He was associate member of American Society of Civil Engineers, past vice president of Sacramento section of the society, past Grand Knight of Third Degree, Knights of Columbus, and Recording Secretary of Fourth Degree, Knights of Columbus Holy Name Society. He was a veteran of World War I, serving with the 23d Engineers, U. S. Army. He is survived by his widow, Dorothy; his son, David; his daughter, Theresa Ann, and his mother, Mrs. Marion C. Wing.

Emergency Repairs

Chili Bar Bridge Job Done Under Unusual Conditions

By A. L. ELLIOTT, Supervising Bridge Engineer

TOWARD the end of February, 1952, the maintenance superintendent, on his regular inspection, noticed a vertical sag and a lateral displacement in the upstream rail of the Chili Bar Bridge over the South Fork of the American River on State Route 93 between Placerville and Georgetown.

The Chili Bar Bridge is a heavy open-spandrel three-span concrete arch built by El Dorado County in 1922 and since included in the State Highway System. The bridge was originally set on a slate formation in which the bedding planes were nearly vertical. Being near the mouth of a narrow canyon, the stream velocities are high and the scouring action is severe. Over the years the pounding of the river gravel and the swift current of the water have worn away much of the slate underneath the center pier.

Bridge Department Acts

The Bridge Department moved its foundation exploration crew onto the job and five holes were drilled through the center pier and the footings to determine the quality of the concrete, as well as the condition of the foundations. Four of the five holes showed open space beneath the pier footing.

Vibration studies were also made on all three piers to determine if possible the relative foundation stability. The vibration studies did not indicate any differences in the three piers. This was interpreted to indicate that the center pier was still partially supported, although possibly only on a few points or large boulders.

As soon as the uncertain condition of the structure was discovered, the bridge was immediately posted for restricted loads of 10 tons per vehicle. School busses were required to unload the children and walk them across the bridge. These precautions were taken to forestall trouble which might result from the impending heavy run-off from this year's abnormal snow pack.



Upper—Looking along the upstream rail of the Chili Bar Bridge toward Georgetown. Note settlement evident in the rail and displacement upstream to the right. Lower—Downstream side of South Fork American River Bridge at Chili Bar. Pier in foreground in center of channel settled on the upstream end and rotated slightly upstream.

Load Restrictions

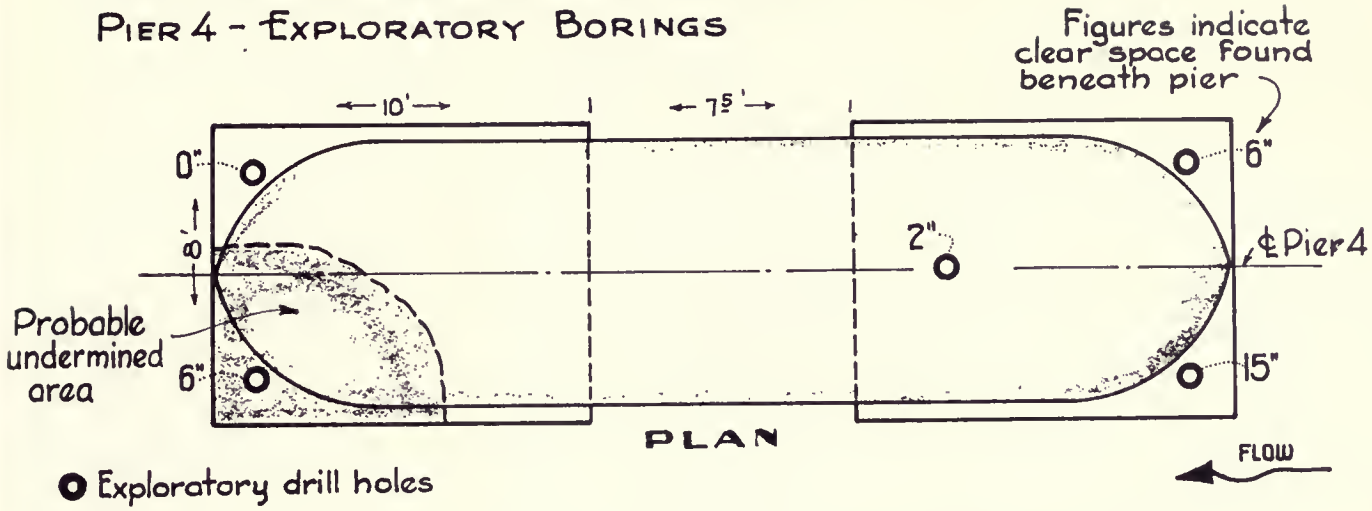
The restriction of the loads on the bridge caused a severe hardship to several companies who had many million board feet of lumber to be hauled out over this road before the spring run-off started. It was necessary that trucks loaded with lumber detour around through Coloma, a distance of about 20 miles. The lumber companies immediately became interested in what could be done to repair or strengthen the bridge. The day after the exploratory drilling was completed, the Chili Bar Bridge repair was declared to be an emergency by order of the Director of Public Works and bids were asked for the planned repairs. A contract was made with a contractor specializing in grouting work and he started moving equipment onto the job the following day, Tuesday, March 11th.

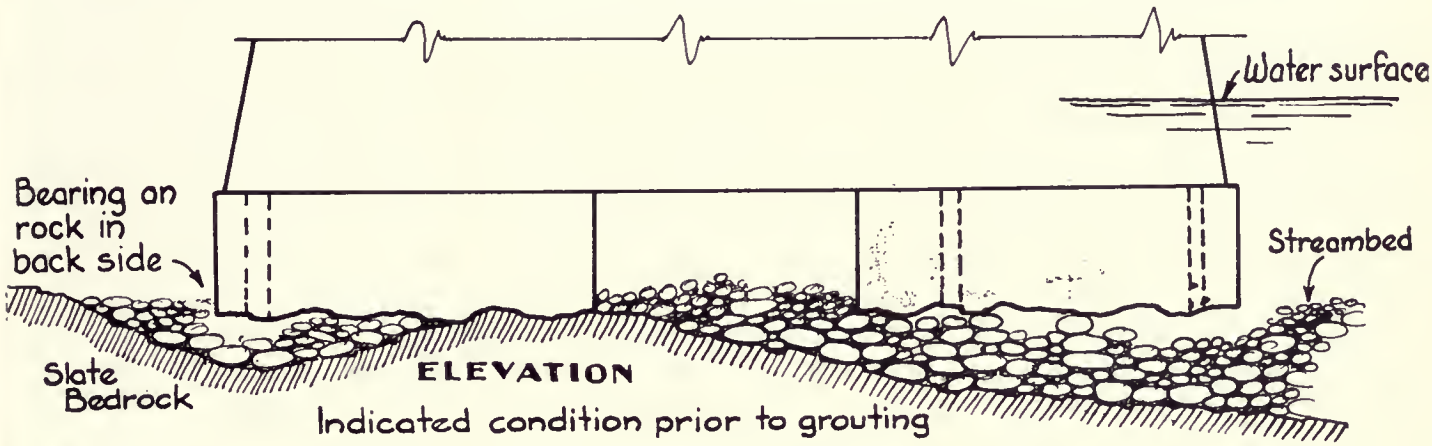
Exploration had shown that the stream bed was washed down to below the bottom of the footing block in some places along the sides of the midstream pier. The plan of repair was to fill around the pier so as to confine the space beneath it and pump grout down through the exploration holes to fill the void, consolidate the gravel and provide support for the pier.

Access Dike Built

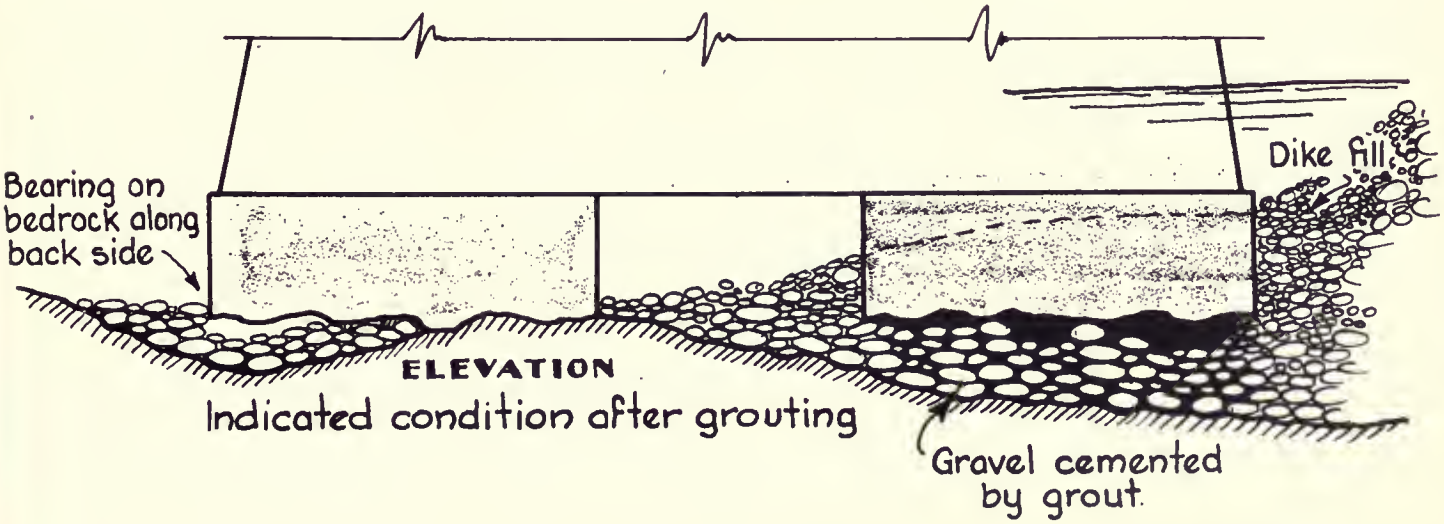
Accordingly the first step was to build an access dike out to the pier and fill around the pier with river sand and gravel from a nearby bar. Using a small drag-line and a truck, the material was end-dumped and bulldozed into position. By Friday night, March 14th, the

SOUTH FORK AMERICAN RIVER - CHILI BAR
PIER 4 - EXPLORATORY BORINGS





5-12-52



nose of the dike was out beyond the pier. On the downstream side, the dike had created a pool of still water around the pier itself.

Because of the susceptibility of the American River at this point to sudden rises as a result of rainfall run-off, advantage was taken of the reasonably good weather which prevailed and the work was carried on over the weekend.

River Rises

Saturday afternoon it started raining and almost immediately the river rose over a foot. The dike had to be raised 18 inches. Still the river was gaining and it looked as though the dike would have to be abandoned. Just at the last minute when the equipment was being taken out of the river—just like a storybook finish—the rain suddenly turned to snow. As though a blotter had been applied to the hills, the river stopped rising and then slowly fell back.

By Sunday night the dike was complete and a fill had been made around the pier completely encasing the upper half of it about five feet above the stream bed.

The plan for an emergency repair to hold the structure through the coming periods of spring high water contemplated the supporting of only the upstream footing of the pier. Borings had shown that the downstream footing was partially supported on solid rock, so it was felt that the downstream footing was not in any immediate danger.

River Is Confined

With the dike complete, the river was confined to a narrow channel through which it roared with four-foot high waves. The larger boulders obtained from the gravel bar were placed on the end of the fill, and they did remarkably well maintaining the nose of the dike against the force of the current.

Monday morning, grout was pumped into the three holes in the upstream footing until it came out through the gravel around the pier. Operations were then stopped so that the grout could set up.

The next day it started raining and the river rose. The jetty and the island around the pier were washed out. Thus, the operation had been completed just in the nick of time, less than 24 hours before the dike went out.

Long Drill Steel Obtained

Long drill steel was then obtained to drill through the grout so that more grout could be put in under pressure at a lower level. The elements again interfered and the passes over the Sierras were closed by snow. The only drill steel available, coming from Reno, was held up in the snow. The steel came through several days later and the three holes in the pier were drilled through again and more grout was forced through under the pier until it oozed through the gravel on the sides.

Core samples were taken through the pier and it was found that the gravel under the pier was completely consolidated down to bedrock. This completed the emergency repairs planned for the winter. It was felt that the foundation of the bridge was stabilized to the point where it would safely withstand the spring run-off. Next summer when the water is low, more extensive repairs will be undertaken to completely support and protect the center pier against future ravages of the stream.

Grouting Successful

After the core borings showed the grouting to be successful, the posting was removed and other restrictions suspended. Frequent checks are being made of the line, grades and general condition. Should anything develop, the posting will immediately be reinstituted, or if necessary, the bridge will be closed.

The settlement and displacement have caused no structural damage to the arch as far as may be determined. Thus, it is not considered necessary to jack the structure back into its former position. Although the bridge is narrow, the volume of traffic is low so after some permanent strengthening of the pier footings this summer, the Chili Bar Bridge should be in service for many more years.

The work was done under the direction of the Bridge Department under an emergency contract prepared by District III of the Division of Highways. The contractor on the work was Ted Schwartz of Nevada City. The Resident Engineer for the Bridge Department was George S. Smith.

BRITISH CORRESPONDENT

THE YORKSHIRE PATENT STEAM WAGON CO.
Hunslet Leeds 10

April 11th, 1952

NORMAN H. HEGGIE, ESQ.
Assistant Physical Testing Engineer
Service and Supply, Headquarters,
State Highways Commission
Street Sweepers

DEAR SIR: I am the president of a British company making street sweepers which are not on the American market, and I was very interested to read your article in the publication *California Highways and Public Works*. The British and American designs of sweepers are dissimilar, particularly in the matter of lifting the sweepings into the body and in the method of attaching the broom fibres to the stock. The mileage you quote for your bristles on the whole agrees with that obtained in Great Britain, though the material to be lifted has obviously a bearing on the brush life.

The British method of fixing broom fibres is to set them in pitch rather than wind them on with a wire rope. I note that you have to soak certain bristles otherwise they break and I am wondering if this is a cause of short brush life although, I must admit that in this country, pitch-set bristles are usually kept wet by the more old-fashioned user as he claims that they do not become brittle.

A further point I would be interested in is the life of the vertical gutter broom. In this country we do not use this but use a horizontal gutter brush whose life is half that of the remainder of the brush. A further point which would be of interest is the life of your conveyor. In this country there are two schools of thought, one which uses a small conveyor and the other paddles. I should be interested to know how you get on, say, when you are sweeping up surface road grit after bituminous spraying with the conveyor type, as the bombardment effect of the grit must cause severe wear on the belting.

Yours sincerely,

(Signed) L. H. RIDDELL

Highway Signs

National Joint Committee Studies Uniform Traffic Control Devices

THE IDEA that "it's a small world" has been applied to so many fields of human activity that traffic engineers are not surprised to see highway signs made a subject for study and discussion by a subunit of the United Nations.

In the United States many highway *warning* signs are based on symbols (cross for "Cross Road," etc.), but on *regulatory* signs the message is usually expressed in words (No Left Turn, One Way, etc.). In many other parts of the world, the regulatory as well as the warning signs are set forth in symbols.

A National Joint Committee on Uniform Traffic Control Devices, cooperating with a group of United Nations experts on road signs and signals, recently devised a tentative proposal for regulatory traffic signs based on symbols. Tests of the effectiveness of these proposed signs have been conducted in various parts of the Nation, to provide the U. N. group with a basis for further discussion.

The chairman of the Joint Committee is H. E. Hilts, Deputy Commissioner of the U. S. Bureau of Public Roads. Tests in California have been conducted under the supervision of Chief Engineer J. W. Johnson of the California State Automobile Association, and Dr. Donald S. Berry, Assistant Director of the Institute of Transportation and Traffic Engineering, University of California, two of the experts on the Joint Committee.

The California Division of Highways has cooperated in the research in this State in testing the suggested symbolic designs for the following regulatory signs:

1. No Passing
2. Do Not Enter
3. No Left Turn
4. Speed Limit

The test was intended to compare the effectiveness of two symbolized signs, designed in different color combinations, and the presently used California standard. (One set of symbolized signs used red, white and black, and the other used black and white only.)



Upper—Two members of the national Joint Committee on Uniform Traffic Control Devices examine two of the proposed international traffic signs—shown alongside their California counterpart—which are the subject of current research suggested by the United Nations. The men are J. W. Johnson (left), Chief Engineer of the California State Automobile Association, and Dr. Donald S. Berry, Assistant Director of the Institute of Transportation and Traffic Engineering, University of California. The bar on the disk-type sign at the extreme left is in red; on the center sign, it is in black. Lower—The proposed symbolized sign for "No Left Turn" makes use of a left-turning arrow with a diagonal bar across it (the bar is red on the left-hand sign, black in the middle one). A diagonal bar is widely used on traffic signs in many countries to mean "no." Tests of the relative effectiveness of the signs were conducted May 22d at the State Fairgrounds in Socramento as part of a series of tests throughout the Nation.

Each group of three signs was placed at the end of a long straightaway, and the observers were driven toward them. The observers made their own recording, on specially prepared forms, to show:

A. Target value of each sign — which caught the observer's attention and was recognized as a traffic sign from the greatest distance, although the message may not be discerned.

B. Which sign first conveyed the intended regulatory message.

C. Which sign the observer prefers.

The information gathered in the California test, which took place at the State Fairgrounds in Sacramento, was tabulated but not analyzed. The data were sent to the Joint Committee on Uniform Traffic Control Devices for analysis and for use in further study.

Meanwhile, the Traffic Department of the California Division of Highways is following the research into symbolized signs with interest to see if the tests and the subsequent studies produce any suggestions which may lead to the improvement of the standardized California highway sign system.

PRAISE FOR ROAD CREWS

GREEN VALLEY LAKE

State Division of Highways
San Bernardino, California

DEAR SIRS: I would like to express my appreciation for the fine job done by your road crews in the San Bernardino Mountains this winter and the courteous treatment and help they have afforded. It is rather amazing to drive such clear roads and see the amount of snow which has had to be handled. It has been necessary for us to be at Green Valley Lake every weekend, so again we thank you.

THE WORTH RUNQUISH FAMILY

THE VULNERABLE PEDESTRIAN

Two out of five persons killed in automobile accidents in the United States are pedestrians, says the California State Automobile Association. In some localities the proportion is even greater. Nearly all pedestrian accidents involve injuries. Keep from getting hurt while you're on foot, by using the crosswalks and walking with the traffic signals.

HISTORY OF UNITED STATES NUMBERED HIGHWAYS

By M. A. O'BRIEN, Highway Signing Supervisor

This is second of two installments of an article by Mr. O'Brien.

THE FOLLOWING policies have been established by the American Association of State Highway Officials regarding the numbering and marking of U. S. highways:

1. The executive committee of the American Association of State Highway Officials shall have full authority to review the U. S. numbered road system and the numbering and marking thereof, to make additions, changes, extensions, revisions, or reductions in said road system and to revise the numbering or marking thereof.

2. Before approving any addition, change, extension, revision, or reduction in the U. S. numbered road system, or the numbering or marking of any U. S. numbered road, the executive committee shall consult the state highway department of the state or states through or within which such addition, change, extension, revision, or reduction is located.

National Policies

3. The state highway department, by a favorable vote on the adoption of this program and policy, agrees and pledges its good faith that it will not erect U. S. markers on any road or take down or change the U. S. markers on any road without the authorization, consent, or approval of the executive committee of the American Association of State Highway Officials, notwithstanding the fact that the changes proposed are entirely within that state.

4. No additional road shall be added to the U. S. numbered road system, and no existing U. S. road shall be extended except where there is a definite showing of an adequately improved highway carrying an established and necessary line of interstate traffic not otherwise provided for by existing U. S. routes and for which traffic adequate service cannot be provided by state route numbers. Extension of present U. S. numbered routes may be made only when the proposed extension is in the general direction of the present route.

   Proposed extensions shall not be made when, to do so, it is necessary to duplicate U. S. routes already established, unless the duplication is for a short distance and the routes then diverge, ending in different terminal points.

5. No new U. S. route located wholly in one state shall be established. U. S. routes, less than 300 miles in length, theretofore established and located wholly in one state, shall be eliminated either by consolidation with other U. S. routes or by reverting to state routes, as rapidly as the state highway department and the Executive Committee of the American Association of State Highway Officials can reach agreement with reference thereto.



North and south U. S. routes are odd numbered as shown above.

First Markers in State

At the time the U. S. Highway System was approved and adopted, the road signing activities in California were carried on by the two major automobile clubs; the California State Automobile Association placed signs in the 45 northern counties and the Automobile Club of Southern California provided service in the 13 southern counties. This work was undertaken on state highways, county roads, and city streets entirely at the expense of the membership of these two clubs.

A search of the records of the California State Automobile Association and Automobile Club of Southern California show that the first markers were placed in California during the month of January of 1928. In the northern area, markers were erected on U. S. 40 from Berkeley to the Nevada state line while in the southern area, U. S. 101 was being signed from Los Angeles to San Diego. Following the marking of U. S. 40, signs were then installed on U. S. 99. This work was coordinated with the signing activities of the Automobile Club of Southern California. The signing of U. S. 101 followed during the summer months in 1928. The two automobile clubs informed the writer that when the U. S. markers were placed, all the old style diamond-shaped directional signs were removed and the new black on white rectangular-shaped signs were provided. Following the signing of U. S. 101, markers were then placed on U. S. 66 and U. S. 91.

State Takes Over

Between the years 1928 and 1934, there was very little activity in the signing of U. S. highways in California. Between these dates the Uniform Manual of Traffic Control Devices was published which set forth certain standards in the marking and positioning of U. S. route markers and arrows.

When the Division of Highways undertook the responsibility of signing for the highways in 1934, it was deemed advisable to review the signing of these routes and bring the signing in conformance with the recently adopted standards. Accordingly, surveys were made of all the major highways, and U. S. routes were completely marked including signing through cities which, in some cases, had been omitted in 1928. Since that time, of course, additional U. S. highways have been approved by the American Association of State Highway Officials and there are now 23 U. S. highways completely signed in California with a total length of approximately 5,958 miles.

On State Sign Routes

Since the U. S. highway numbering system can only be applied to the interstate highways, it was found desirable to mark local routes of travel with a system of state numbered highways, customarily referred to as state sign routes. The sign routes provide a marking system for those highways which are intrastate. Accordingly, meetings were held by the representatives of the two automobile clubs and the maintenance engineer to devise a numbering system for other California highways. A route marker now known as the "bear shield," was adopted from a wide range of designs submitted. The present route marker was adopted as it resembled the miner's spade and displayed a grizzly bear taken from the California Bear Flag.

In selecting numbers for the state sign routes, a numerical system following the U. S. Highway System was adopted. All routes that follow a more or less north and south direction were given odd numbers; the east and west routes were given even numbers. In order to avoid, as far as possible, any claims of partiality between the north and the south, the smaller numbers were evenly divided between these two areas. State Sign Route 1 was assigned to the coast route between Las Cruces in Santa Barbara County to Westport in Mendocino County. This route traverses both the north and south portions of the State. After this number was used, the next odd and even numbers were assigned in pairs; i.e., 2 and 3 were given to the south, and 4 and 5 to the north, etc. An effort was made to have the numbers increase for north and south routes as you proceed from west to east.

In selecting numbers for the state sign route system, numbers given to existing U. S. highways were purposely omitted so that there would be no duplication. The marking of state sign routes began in the fall of 1934 and has been progressive through the intervening years.

At the present time there are 76 state sign routes in California with a total of 7,486 miles.

This is a state sign raute marker located on State Sign Route 89 bordering Lake Tohae.



Cost Index

California Highway Construction Prices Down 8.4 Percent First Quarter

By RICHARD H. WILSON, Assistant State Highway Engineer
H. C. McCARTY, Office Engineer
JOHN D. GALLAGHER, Assistant Office Engineer

TABULATION of contracts awarded for California State highway construction during the first quarter of 1952 revealed a decline in the average unit prices of the principal contract items which resulted in a drop from the previous quarter of 8.4 percent in the California Highway Construction Cost Index. The index for the first quarter of the year was 224.8 (1940=100) which is 20.6 points below the 245.4 of the fourth quarter of 1951.

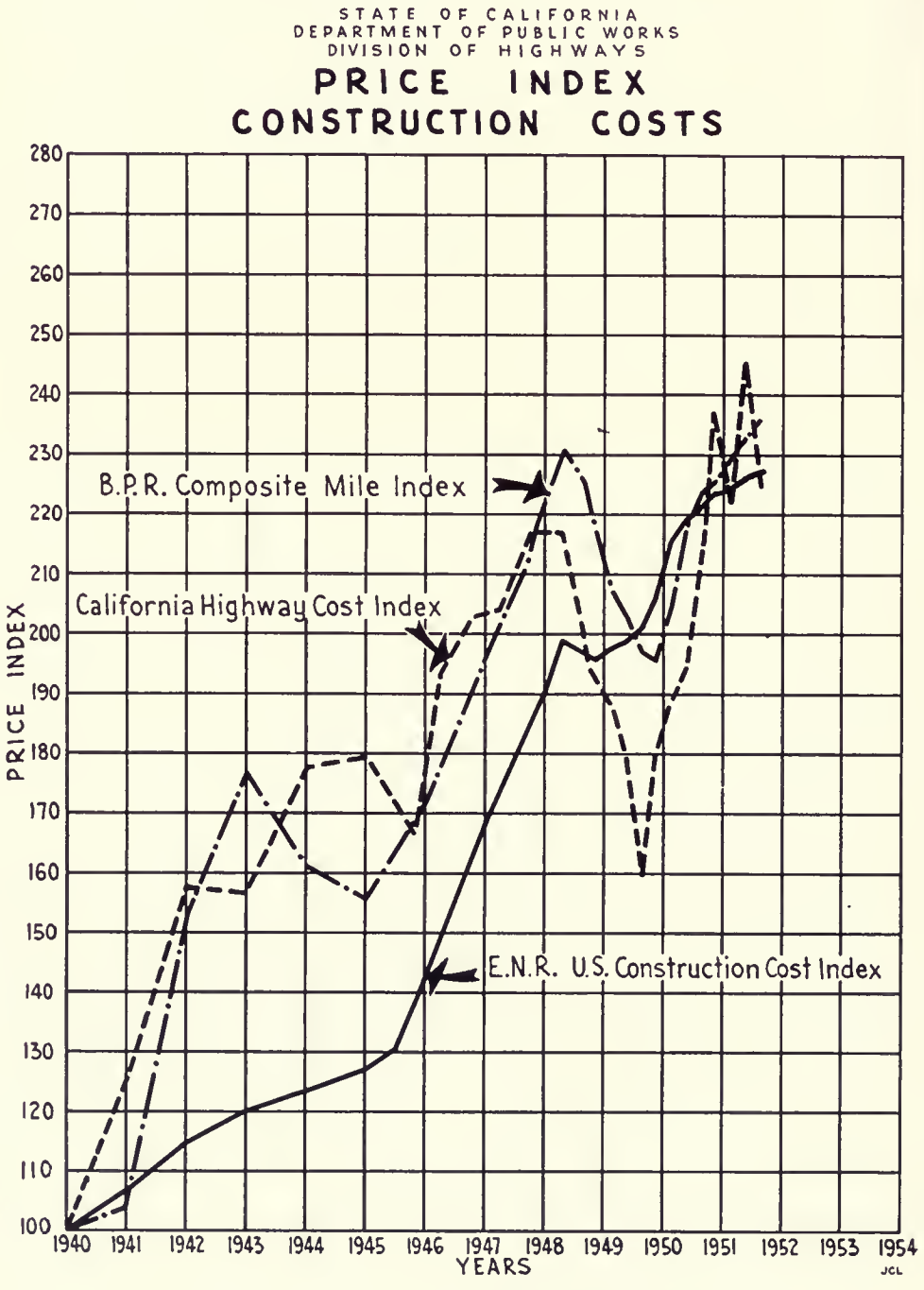
Lack of Stability

The rise and fall of highway construction costs during the past year as reflected in the California Index indicates a current lack of stability in trends. From a seven-year low in the first quarter of 1950, when the index had dropped to 160.0, there began a steady rise which continued through the second quarter of 1951 to reach 238.3. During the third quarter of 1951 there was a 6.9 percent drop in the index back to 221.9 and then during the last quarter of the year a rise to an all-time high of 245.4, and now comes the 8.4 percent drop back to 224.8.

While the up and down movements in highway construction costs in the past nine months may reflect uncertainty on the part of some bidders with regard to the immediate future, it is our opinion that a firm downward trend will not occur for some months.

Steel Situation

The steel situation does not portend any drop in prices even though available tonnage should become more adequate. Announcement by the Wage Stabilization Board on March 13th of its approval of the Construction Industry Commission's policy for 1952 of a 15-cent-an-hour increase over the 10 percent formula adopted last August will probably be followed by increases in construction costs. Contemplated expansion of health and welfare plans in the construction industry with employer contributions of 7½ cents per hour indicate still additional increases in costs.



The large volume of construction projects programmed by federal, state, and local governments coupled with planned expansion in private industry is likely to prevent noticeable reduction in costs from acute competition. However, the California Division of Highways has no complaint on the score of lack of bidders. Few state highway projects attract less than four or five bidders and as high as 16 bids have been received on one project at recent openings.

Competition May Be Factor

While the California Highway Construction Cost Index dropped 8.4 percent during the first quarter of 1952, it is felt that this may be due to local conditions and to competition between contractors for projects to be awarded early in the construction year. The Engineering News-Record Construction Cost Index, reaching 227.0 in the first quarter of 1952, continues a steady upward trend on a national scale, as does the Bureau of Public Roads Composite Mile Index which was 236.2 in the first quarter of 1952. Bureau of Public Roads figures indicate that excavation was the only major item which showed any drop in 1951; concrete pavement, reinforcing steel and structural concrete all reached 20-year peaks in 1951 as did the Composite Mile Index, with its trend still upward.

Examination of average contract prices for state highway work shows them to be uniformly lower during the first quarter of 1952, with the exception of concrete pavement. Nevertheless we are still of the belief that the peak of the inflationary spiral has not been reached and that it will be many months or possibly a year before a firm downward trend may be evident.

CALIFORNIA HIGHWAY CONSTRUCTION COST INDEX

Period	Index 1940=100	Change from previous period	Change from 1948	Change from 1st qtr. 1950
1940	100	.....	.....	.....
1941	125.0	+25.0%	.....	.....
1942	157.5	+26.0%	.....	.....
1943	156.4	— 0.7%	.....	.....
1944	177.8	+13.7%	.....	.....
1945	179.5	+ 1.0%	.....	.....
1946	179.7	+ 0.1%	.....	.....
1947	203.3	+13.1%	.....	.....
1948	216.6	+ 6.5%	.....	.....
1949	190.7	—12.0%	.....	.....
1950 (1st qtr.)	160.0	—10.5%	—26.1%	.....
1950 (2d qtr.)	180.0	+12.5%	—16.9%	+12.5%
1950 (3d qtr.)	189.2	+ 5.1%	—12.7%	+18.3%
1950 (4th qtr.)	194.8	+ 3.0%	—10.1%	+21.8%
1951 (1st qtr.)	215.4	+10.6%	— 0.6%	+34.6%
1951 (2d qtr.)	238.3	+10.6%	+10.0%	+48.9%
1951 (3d qtr.)	221.9	— 6.9%	+ 2.4%	+38.7%
1951 (4th qtr.)	245.4	+10.6%	+13.3%	+53.4%
1952 (1st qtr.)	224.8	— 8.4%	+ 3.7%	+40.5%

CALIFORNIA DIVISION OF HIGHWAYS

AVERAGE CONTRACT PRICES

	Roadway excavation, per cu. yd.	Crusher run base, per ton	Plant-mix surfacing, per ton	Asphalt concrete pavement, per ton	PCC pavement, per cu. yd.	PCC structures, per cu. yd.	Bar reinforcing steel, per lb.	Structural steel, per lb.	
1940	$0.22	$1.54	$2.19	$2.97	$7.68	$18.33	$0.040	$0.083	All projects
1941	0.26	2.31	2.84	3.18	7.54	23.31	0.053	0.107	
1942	0.35	2.81	4.02	4.16	9.62	29.48	0.073	0.103	
1943	0.42	2.26	3.71	4.76	11.48	31.76	0.059	0.080	
1944	0.50	2.45	4.10	4.50	10.46	31.99	0.054	0.132	
1945	0.51	2.42	4.20	4.88	10.90	37.20	0.059	0.102	
1st Half, 1946	0.41	2.31	4.00	4.54	9.85	37.38	0.060	0.099	Federal aid projects only
2d Half, 1946	0.39	2.27	4.12	5.04	12.39	49.84	0.079	0.142	
1st Half, 1947	0.48	2.62	4.52	6.46	12.41	47.03	0.080	0.133	
2d Half, 1947	0.54	2.39	4.02	6.48	11.58	50.15	0.089	0.123	All projects
1st Half, 1948	0.56	2.45	4.42	4.91	13.37	49.51	0.094	0.145	
2d Half, 1948	0.52	2.64	4.80	7.00	14.01	49.08	0.103	0.131	
1st Quarter, 1949	0.49	2.48	4.54	5.70	11.84	48.11	0.089	0.113	
2d Quarter, 1949	0.43	2.91	4.63	4.06	11.74	48.63	0.083	0.110	
3d Quarter, 1949	0.41	2.40	5.05	4.60	11.53	45.35	0.080	0.093	
4th Quarter, 1949	0.43	2.55	3.78	3.50	12.66	44.54	0.078	0.092	
1st Quarter, 1950	0.34	2.22	3.65	3.74	.....	40.15	0.077	0.081	
2d Quarter, 1950	0.40	2.13	4.48	3.74	10.86	43.03	0.080	0.105	
3d Quarter, 1950	0.41	2.32	4.25	5.50	10.91	44.34	0.093	0.131	
4th Quarter, 1950	0.42	2.81	4.64	4.61	12.55	43.18	0.098	0.120	
1st Quarter, 1951	0.45	3.07	4.06	5.22	11.71	46.38	0.103	0.206	
2d Quarter, 1951	0.63	3.88	4.56	4.63	12.93	51.50	0.105	0.166	
3d Quarter, 1951	0.56	2.88	4.59	3.90	12.41	46.14	0.107	0.165	
4th Quarter, 1951	0.66	2.91	5.66	4.89	12.71	49.38	0.105	0.169	
1st Quarter, 1952	0.56	3.25	4.88	4.77	14.25	47.46	0.094	0.152	

HIGHWAY DEFINITIONS—RIGHT-OF-WAY TERMS*

Right of Way—A general term denoting land, property, or interest therein, usually in a strip, acquired for or devoted to a highway.

Fee Simple—An absolute estate or ownership in property including unlimited power of alienation.

Acquisition or Taking—The process of obtaining right of way.

Partial Taking—The acquisition of a portion of a parcel of property.

Remainder—The portion of a parcel retained by the owner after a part of such parcel has been acquired.

Remnant—A remainder so small or irregular that it usually has little or no economic value to the owner.

Easement—A right acquired by public authority to use or control property for a designated highway purpose.

Slope Easement—An easement for cuts or fills.

Drainage Easement—An easement for directing the flow of water.

Sight Line Easement—An easement for maintaining or improving the sight distance.

Planting Easement—An easement for reshaping roadside areas and establishing, maintaining, and controlling plant growth thereon.

Scenic Easement—An easement for conservation and development of roadside views and natural features.

Abandonment—Cessation of use of right of way or activity thereon with no intention to reclaim or use again for highway purposes. (Sometimes called vacation.)

Right of Access—The right of ingress to a highway from abutting land and egress from a highway to abutting land. (See control of access.)

Highway Development Right—The right of owners to make changes in abutting property uses, which, if exercised, would be inconsistent with present and future highway needs.

Riparian Rights—The rights of an owner of water-fronting lands in the bed, banks, accretions, water, access, moorage, and related items.

General Benefit—Advantage accruing from a given highway improvement to a community as a whole, applying to all property similarly situated.

Special Benefit—Advantage accruing from a given highway improvement to a specific property and not to others generally.

Direct Compensation—Payment for land or interest in land and improvements actually acquired for highway purposes. (Sometimes called direct damages.)

Severance Damages—Loss in value of the remainder of a parcel resulting from an acquisition. (Sometimes called indirect damages.)

Consequential Damages—Loss in value of a parcel, no portion of which is acquired, resulting from a highway improvement.

Just Compensation—A full and fair equivalent for the loss sustained by the owner as a result of taking or damaging of private property for highway purposes.

Donation—The voluntary conveyance of private property to public ownership and use, without compensation to the owner.

Dedication—The setting apart by the owner and acceptance by the public of property for highway use, in accordance with statutory or common law provisions.

Negotiations—The process by which property is sought to be acquired for highway purposes through discussion, conference, and final agreement upon the terms of a voluntary transfer of such property.

Eminent Domain—The power to take property for public use with just compensation therefor.

Condemnation—The process by which property is acquired for highway purposes through legal proceedings under power of eminent domain.

Inverse Condemnation—The legal process by which a property owner may claim and receive compensation for the taking of, or payment for damages to, his property as a result of a highway improvement.

Right of Immediate Possession—The right to occupy property for highway purposes, after preliminary steps for acquisition have been taken and before final settlement.

Right of Survey Entry—The right to enter property temporarily to make surveys and investigations for proposed highway improvements.

Right-of-Way Strip Map—A plan of a highway improvement showing its relation to adjacent property, the parcels or portions thereof needed for highway purposes, and other pertinent information.

Parcel Plat—A map of a single parcel of property or portion thereof needed for highway purposes, showing the boundaries, areas, the remainder, improvements, access, ownership, and other pertinent information.

Setback Line—A line outside the right of way, established by public authority, on the highway side of which the erection of buildings or other permanent improvements is controlled.

Roadside Control—The public regulation of the roadside to improve highway safety, expedite the free flow of traffic, safeguard present and future highway investment, conserve abutting property values, or preserve the attractiveness of the landscape.

Zoning—The division of an area into districts and the public regulation of the character and intensity of use of the land and improvements thereon.

Roadside Zoning—The application of zoning for roadside control.

Market Value—The highest price for which property can be sold in the open market by a willing seller to a willing purchaser, neither acting under compulsion and both exercising reasonable judgment.

Highest and Best Use—The most productive use, reasonable but not speculative or conjectural, to which property may be put in the near future.

* Adopted by the American Association of State Highway Officials, January 1, 1952.

Right-of-way Appraisal—A determination of the market value of property including damages, if any, as of a specified date, resulting from an analysis of facts.

Right-of-way Estimate—An approximation of the market value of property including damages, if any, in advance of an appraisal.

Title—The evidence of a person's right to property or the right itself.

Title Search—An investigation of public records and documents to ascertain the history and present status of title to property, including ownership, liens, charges, encumbrances, and other interests.

Title Opinion—An analysis and interpretation of a title search concerning present ownership, encumbrances, clouds on title, and other infirmities.

Abstract of Title—A document showing the condensed history of the title to property, containing portions of all conveyances or other pertinent instruments relating to the estate or interest in the property, and all liens, charges, encumbrances, and releases.

Certificate of Title—A document based on a title search stating that title or interest in property is vested in a designated person and showing outstanding liens, charges, or other encumbrances.

Guarantee Title—A title, the validity of which is insured by an abstract, title, or indemnity company. (Sometimes called insured title.)

Torrens Title—A certificate of title issued by a public authority under a system wherein all deeds and documents affecting real property are registered.

Conveyance—A written instrument by which a title, estate, or interest in property is transferred.

Deed—A duly attested written instrument, under seal, conveying real property or interest therein.

Warranty Deed—A deed containing covenants by the grantor, for himself and his heirs, to the grantee and his heirs, to warrant and defend the title and possession of the estate conveyed.

Quitclaim Deed—A deed conveying, without warranty, any title, interest, or claim which the grantor may have in the estate conveyed.

Option—A written agreement granting a privilege to acquire property or interest therein at a fixed price within a specified period.

Early Days

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Fletcher Purchasing Agent

At the same meeting, on January 6th, the Highway Engineer reported that he had bought certain supplies, and from the names of the companies furnishing them it would seem that they were drafting supplies of different kinds, and filing cases. The commission ratified his actions in doing such. It also voted that on this day it would grant audiences to eight different groups on January 24th, and on this same day there is a list of 12 to 15 communications which were ordered filed. The commission also appointed the Highway Engineer to act as purchasing agent of the commission as far as his department was concerned, in addition to his other duties, this to be done until such time as the purchasing agent was appointed. And on January 6th, we also have record of the first communication regarding the Castaic Ridge Road, and Commissioner Darlington was requested to take up the matter with the writer and report to the commission later.

Those Autos Again

On January 8th the commission reconvened at 9 a.m. and opened bids from different automobile dealers. There was a bid from the Franklin Automobile Company for $2,200 each for 25 h.p. four-cylinder cars, and $3,000 each for 38 h.p. six-cylinder cars. The commission also had a bid from Don Lee, agent for the Cadillac automobile, for four cars for $8,632.40. Each Cadillac would cost $2,158.10. These figures were for four-cylinder, 32 h.p. cars. The commission decided that it would take the matter under advisement, and then Mr. Blaney was requested to go to San Francisco and get competitive bids, in quadruplicate, for one, two, three, and four automobiles delivered in San Francisco. These were to be for Cadillac, Franklin, Chalmers and Hudson cars, and equipment to cover at least "glass front, B Presto-lite tanks, with a good windshield, a speedometer, large Klaxon horn, one extra four-inch casing, two extra inner tubes, one tire cover, one set of tire irons, a top, four-inch tires all around, and two pairs of Weed chains."

And another piece of business transacted on January 8th was that the geologists assigned to the different divisions of the State would be paid $100 per month and their reasonable expenses of travel and subsistence. A recess was taken until 2 p.m.

That afternoon the commissioners listened to a group from Yreka representing Siskiyou County regarding roads, and called it a day. On January 9th they listened to two different people regarding roads in Trinity County and in Yolo County and then recessed until 2 p.m. In the afternoon they voted that the office hours of the California Highway Commission at the Sacramento Headquarters would be from 8.30 a.m. to 5 p.m. each week day, and from 8.30 a.m. to 12 noon on Saturdays, and that all division headquarters would be open from 8 a.m. to 5 p.m. each day, and from 8 a.m. to 12 noon on Saturdays.

Up to now, the commissioners had been interested in the expansion program a bit, so they decided they were going to do something about their Division Office at Redding and at San Luis Obispo. So the Highway Engineer was empowered to enter into negotiations at both places.

(To Be Continued)

ARMSTRONG NUGGET

The Armstrong Nugget, sold to the First National Bank of Baker in Oregon during the gold rush days of the 1860's for about $500, is reported by the National Automobile Club to be now the central attraction in the bank's gold display and to be valued at close to $3,000.

NIGHT DRIVING TIPS

When you drive at night take it easy and reduce your speed. Keep your headlights and windshield clean so you can see better, and be constantly alert for pedestrians. Night driving is hazardous at best and takes extra skill and special caution.

Spectroscope

Continued from page 10 . . .

spectrographic operation and a reference to charts for percentage values of all elements desired. That time, however, is in the dim future.

The Spectrograph

The spectrograph, of course, involves the photographic recording of the spectrum of the thing under observation. The excitation of spectral lines in this type of procedure may be by flame, electric arc or electric spark. An extensive investigation of a spectrum of metals generally requires the arc. If the light from the arc between two iron electrodes with a sample of unknown material between them is passed through a narrow slit of the spectrograph and refracted by a quartz prism, lines which are images of the slit can be photographed. The lines will be located at places corresponding to characteristic wave lengths associated with material in the source of light. Iron which has a complex spectrum will predominate, but metals in the sample will be represented too. The density of the line on the photographic film is proportional to the quantity of material producing the line, all other conditions being constant. Maintaining these conditions constant, even when referring to a standard, is not so easily done in most cases.

Spark Excitation

Operators of spectrographic instruments usually resort to spark excitation of the spectra to get the lines from nonmetallic elements. The exciting energy is higher and in some cases produces better defined lines with such elements as carbon, silicon, boron, etc.

It is not within the scope of an article of this kind to discuss the details of technique or the theoretical aspects of spectroscopy. However, since the advent of the atomic bomb many people have become conscious of the structure of the atom and nearly everybody has the conception of an atom as being a nucleus of neutrons and protons surrounded by electrons. The electrons are located in layers or orbits around the nucleus. According to current theories, if an atom is activated by any means of excitation such as thermal or radiant energy, electrons may move away from the nucleus to what we may term a different energy level. The limitations of this movement are due chiefly to the structure of the atom which prevents chaotic energy disturbances and allows only certain discrete increases in energy. The return of an electron to its normal position or from one location to another is accompanied by radiant energy or light. This is the light that shows up in the spectra in definite places. The more orbits from which an electron may pass to another orbit, the more complex the spectrum, provided the exciting energy is sufficient to activate the more secluded electrons. This explains why high energy excitation increases the number of lines in the spectra of many elements from that observed in simple incandescence.

If a series of spectrographs could be made to follow the progressive nuclear fission of Plutonium or Uranium 235, we should, undoubtedly have the most interesting spectral record in history. In other words, if we could follow the spectral phenomena in an atomic bomb explosion we could expect some unusual results. The barrier of technical difficulties to such a recording will probably preclude its taking place in any satisfactory manner.

State Highway Vacuum Cleaner

Continued from page 25 . . .

film in order to get adequate coverage of the vacuum cleaner in operation. He was very enthusiastic regarding what the vacuum cleaner would do in removing trash from the highways in an efficient and economical manner, and considered it a very good subject for television.

To indicate the wide spread of publicity that will be given the film, the National Broadcasting Company has informed us of its showing on several television programs, including "Newspaper of the Air," "World Digest," "Industry on Parade," and the Dave Garroway Show titled "Today—Today." The first showing was Wednesday evening, May 7, on KNBH, Channel 4, in Los Angeles.

Erosion Control

Continued from page 24 . . .

for assistance in justifying the cost of erosion control. If we consider that an unprotected slope would probably lose one-fourth the quantity of soil that the Oceanside slope did during a storm of equal intensity and that it would cost one-fourth as much to clean up the slough, it would only take seven storms of that intensity to equal the cost of slope protection. Then, since soil loss continues indefinitely on an unprotected slope, the cost of cleaning up slough thereafter would be a constant expense and, since it could have been prevented, an economic waste.

The cost figures for slope protection used in this discussion are not necessarily representative of the costs of slope protection on a state-wide basis. Bid prices for slope preparation run from about $0.05 to $0.15 per square yard, and the cost of straw, spread and rolled into the slope will average about $60 per ton. The average cost appears to be in the neighborhood of $0.13 per square yard.

Travel in Utah Not Restricted by Floods

The Utah State Road Commission has advised the California Division of Highways that flood conditions are not interfering with travel in Utah.

While the flood caused by the unusually high spring run-off is a very serious problem in certain areas, these areas are the lowlands and affect a comparatively small section of the state. With few exceptions, all highways and roads are being kept open. In isolated cases where a small section of a highway has been temporarily closed, alternate routes have been designated. The flooded area in no way prevents travel to any of the state's tourist attractions. This flood condition is only temporary and as soon as it is over, any damage to the roads will be quickly repaired.

HIGHWAY BIDS AND AWARDS

April, 1952

CONTRA COSTA COUNTY—Between Willow Road and First Street in Rodeo, about 0.7 mile, existing pavement to be widened with plant-mixed surfacing on cement treated base. District IV, Route 14, Section B. Parish Bros., Benicia, $69,861; O. C. Jones & Sons, Berkeley, $79,546; J. Henry Harris, Berkeley, $80,336. Contract awarded to Lee J. Immel, San Pablo, $64,717.10.

CONTRA COSTA COUNTY—In the City of El Cerrito at the intersection of San Pablo Avenue with Manila Avenue-Bay View Avenue, a traffic signal system to be furnished and installed. District IV, Route 14. L. H. Leonardi Electric Construction Co., San Rafael, $3,599; Hall Sloat Electric Co., Inc., Oakland, $3,986; Underground Electric Construction Co., Oakland, $3,995. Contract awarded to R. Flatland, San Francisco, $3,425.

COLUSA COUNTY—At High Ditch and Wilkins Slough, about 18 and 21 miles south of Colusa, existing bridges to be repaired and approaches to be graded, imported base material to be placed thereon and bituminous surface treatment to be applied. District III, Route 88, Section A. Rice Bros., Inc., Marysville, $23,245; R. G. Clifford & C. O. Bodenhamer, Berkeley, $25,100; O'Connor Bros., Red Bluff, $31,780. Contract awarded to Charles S. Moore & Robert R. Murdoch, Oakland, $20,949.25.

FRESNO COUNTY—On Blackstone Avenue between Olive Avenue and Shields Avenue in and near the City of Fresno, traffic signal system to be revised and highway lighting to be furnished and installed at one intersection; traffic signal systems and highway lighting to be furnished and installed at five intersections; all six traffic signal systems to be interconnected; and highway lighting to be furnished and installed at six intersections. District VI, Route 125, Section Fre., C. Howard Electric Co., Gilroy, $60,812; R. Goold & Son, Stockton, $61,625; Robinson Electric, Fresno, $62,742; Paul R. Gardner, Ontario, $63,744; L. H. Leonardi Electric Construction Co., San Rafael, $65,323; Dale Electric, Fresno, $68,535. Contract awarded to Westates Electrical Construction Co., Los Angeles, $57,790.

IMPERIAL COUNTY—Between the south city limit of Brawley and 1.1 miles west of Brawley, about 1.7 miles of divided highway to be graded, imported subbase material to be placed, cement treated base to be constructed, and surfaced with plant-mixed surfacing and a reinforced concrete slab bridge to be constructed across New River. District XI, Route 26, Section Brw., H. Ralph B. Slaughter & E. C. Young, San Fernando, $367,187; Cox Bros. Construction Co., Stanton, $431,667; Norman I. Fadel, North Hollywood, $495,317. Contract awarded to Basich Bros. Construction Co., N. L. Basich & R. L. Basich, Garvey, $354,024.30.

INYO COUNTY—Portions between Kern County line and Dunmovin, a net length of about 17.6 miles, portions to be graded and surfaced with plant-mixed surfacing and untreated rock base, bituminous surface treatment to be applied to shoulders on portions and a "Class B-single" seal coat applied to other portions. District IX, Route 23, Section G, H. G. W. Ellis Construction Co., North Hollywood, $141,809; Oilfields Trucking Co. & Phoenix Construction Co., Inc., Bakersfield, $168,373; Flickinger & Welker, Inc., Los Angeles, $173,040; Ball & Simpson, Berkeley, $211,719. Contract awarded to Rice Brothers, Inc., Marysville, $129,956.60.

KINGS AND TULARE COUNTIES—Between one mile north of Corcoran and three-fourths mile south of Kings-Tulare County line, about 4.2 miles to be graded and paved with plant-mixed surfacing on cement treated base. District VI, Route 135, Sections B, A. M.J.B. Construction Co., Stockton, $368,462; Volpa Brothers, Fresno, $382,219; Oilfields Trucking Co. & Phoenix Construction Co., Inc., Bakersfield, $385,253; Ralph A. Bell, Monrovia, $387,348; Harms Bros., Sacramento, $483,946. Contract awarded to Baun Construction Co., Fresno, $360,290.

LAKE COUNTY—At Lucerne Creek and at Deer Creek, about 8.5 miles and 9 miles east of Upper Lake, two reinforced concrete box culverts to be constructed. District I, Route 15, Section B. C. W. Peterson, North Hollywood, $27,391; Pike & Hill, Carey Bros. & Bailey, San Rafael, $28,739; R. G. Clifford & C. O. Bodenhamer, Berkeley, $28,787; Ted Schwartz, Grass Valley, $28,799; H. H. Anderson, San Leandro, $29,555; Bos Construction Co., Oakland, $29,671; M. C. Baldwin, Watsonville, $29,940; Nomellini Construction Co., Stockton, $30,210; Al Erickson & Co., Napa, $31,484; R. E. Hertel, Sacramento, $31,894; O'Connor Bros., Red Bluff, $34,035; B. S. McElderry, Berkeley, $36,325. Contract awarded to A. A. Edmondson, San Fernando, $21,246.50.

LOS ANGELES COUNTY—City of Los Angeles, on Santa Ana Freeway, from Los Angeles Street to Lyon Street, highway lighting and illuminated sign system to be furnished and installed; existing street lighting systems to be modified and conduit for fire alarm system to be installed. District VII, Route 2. Electric and Machinery Service, Inc., South Gate, $36,516; Newbery Electric Corp., Los Angeles, $36,815; Fischbach and Moore, Inc., Los Angeles, $37,345; Westates Electrical Construction Co., Los Angeles, $38,042. Contract awarded to Ets-Hokin & Galvan, Inc., Wilmington, $35,660.

LOS ANGELES COUNTY—In the City of Pomona, between Hamilton Boulevard and west city limits (portions), about 0.7 mile in length, existing roadway to be surfaced with asphalt concrete. District VII, Route 26. Matich Brothers, Colton, $32,284; W. E. Hall Construction Co., Alhambra, $33,263; Vido Kovacevich Co., South Gate, $33,945; Griffith Company, Los Angeles, $34,705; J. E. Haddock, Ltd., Pasadena, $34,888; George Herz & Co., San Bernardino, $34,979; Warren Southwest, Inc., Torrance, $35,453; Ralph J. Laird, La Verne, $35,525; E. L. Yeager Co., Riverside, $40,321. Contract awarded to R. A. Erwin, Colton, $30,350.

LOS ANGELES COUNTY—In the City of San Gabriel, between west city limits and east city limits, about 1.2 miles, the existing pavement to be widened with untreated rock base and the existing pavement and newly constructed untreated rock base surfaced with plant-mixed surfacing. District VII, Route 77. Warren Southwest, Inc., Torrance, $55,733; Griffith Company, Los Angeles, $58,785; J. E. Haddock, Ltd., Pasadena, $60,808; W. E. Hall Construction Co., Alhambra, $66,895; George Herz & Co., San Bernardino, $68,884; Pacific Rock & Gravel Co., Monrovia, $74,306. Contract awarded to Vido Kovacevich, South Gate, $55,732.50.

LOS ANGELES COUNTY—In the City of Los Angeles on Santa Monica Boulevard, between Seward Street and Gower Street, about 0.6 mile, the upper portion of existing pavement to be removed and plant-mixed surfacing placed. District VII, Route 162. Griffith Company, Los Angeles, $17,744; Vernon Paving Co., Los Angeles, $18,256; Schroeder & Company, Sun Valley, $18,969. Contract awarded to G. J. Payne Company, Inc., Los Angeles, $16,740.

LOS ANGELES COUNTY—On Santa Ana Freeway, over San Gabriel River, two miles east of Downey, a reinforced concrete girder bridge and approach embankments to be constructed. District VII, Route 166, Section A. O. B. Pierson & P. D. Ware, Paramount, $483,571; Oberg & Cook, Gardena, $486,652; J. E. Haddock, Ltd., Pasadena, $495,571; Tumblin Company, Bakersfield, $498,718; MacDonald and Kruse, Sun Valley, $502,850; A. Teichert & Son, Inc., Sacramento, $535,054; Guy F. Atkinson Company, Long Beach, $543,058; C. B. Tuttle Co., Long Beach, $546,489; W. J. Disteli, Los Angeles, $557,274. Contract awarded to United Concrete Pipe Corp., Baldwin Park, $477,545.

LOS ANGELES COUNTY—Between Anaheim-Telegraph Road and Garvey Avenue, about 4.1 miles, plant-mixed surfacing to be placed over existing pavement on a portion of the project and a portion to be widened with imported subbase material and untreated rock base and plant-mixed surfacing placed over the new base and existing pavement. District VII, Route 167, Sections A, MonP. Warren Southwest, Inc., Torrance, $179,004; J. E. Haddock, Ltd., Pasadena, $189,506; Griffith Company, Los Angeles, $189,952; Pacific Rock & Gravel Co., Arcadia, $193,625; M. S. Mecham & Sons, South Gate, $194,965. Contract awarded to Vido Kovacevich Co., South Gate, $175,487.

LOS ANGELES COUNTY—Over Los Angeles River Freeway, at Artesia Street in Long Beach, a reinforced concrete bridge to be constructed, and about 0.3 mile of approaches to be graded and surfaced with plant-mixed surfacing. District VII, Routes 167, 175. R. M. Price Co., Altadena, $437,645; Guy F. Atkinson Company, Long Beach, $444,638; MacDonald and Kruse, Sun Valley, $501,759. Contract awarded to J. E. Haddock, Ltd., Pasadena, $404,707.80.

LOS ANGELES COUNTY—On Lakewood Boulevard across flood control channel, at Del Amo Boulevard, a reinforced concrete box culvert to be constructed. District VII, Route 168, Section A. E. G. Perham, Los Angeles, $53,137; Service Construction Co. of Southern California, a Corporation, Burbank, $54,173; Thomas Construction Co., Fresno, $57,337; N. M. Saliba Company, Los Angeles, $59,762; Vido Kovacevich Co., South Gate, $63,099; Stuckey and Carroll Construction Co., El Monte, $73,624. Contract awarded to Concrete Construction Service, Inc., Gardena, $48,912.

LOS ANGELES COUNTY—On Manchester Boulevard, in the City of Ingelwood, between Crenshaw Drive and Van Ness Avenue, about 0.8 mile, existing shoulders to be excavated, imported base material and untreated rock base placed, and the roadway to be surfaced with plant-mixed surfacing. District VII, Route 174. Vido Kovacevich Co., South Gate, $59,263; Vernon Paving Co., Los Angeles, $61,457; C. O. Sparks, Inc., and Mundo Engineering Co., Los Angeles, $64,065; Griffith Company, Los Angeles, $65,709; Oswald Bros. Co., Los Angeles, $67,851. Contract awarded to Warren Southwest, Inc., Torrance, $56,387.

MADERA AND MERCED COUNTIES—Across Fresno River at Madera and over the tracks of the Santa Fe Railway near Merced, two existing steel bridges to be cleaned and painted. District VI, Routes 4, 18, Sections D, A. D. Zelinsky & Sons, San Francisco, $16,761; D. E. Burgess Co., San Francisco, $20,511; J. S. Morris Co., Berkeley, $22,680; R. W. Reade & Co., Berkeley, $23,302; Klaas Brothers, Los Angeles, $23,784; J. P. McGuire Painting Co., San Jose, $24,894; Deemer & Deemer, San Francisco, $27,200; Nels P. Christensen Painting Co., Santa Barbara, $49,488; Gaytan & Leiher, Los Angeles, $66,420. Contract awarded to H. C. McKern, San Jose, $12,135.

MARIN COUNTY—At San Pedro Road, near the north city limits of San Rafael, about 0.9 mile of state highway to be constructed together with cross roads and road approaches; imported subbase material, crushed rock base, Portland cement concrete pavement and plant-mixed surfacing to be placed and a reinforced concrete slab bridge (undercrossing) to be constructed. District IV, Route 1, Section A. A. G. Raisch Co., San Rafael, $196,309; Granite Construction Co., Watsonville, $209,471; E. A. Forde Co., San Anselmo, $210,103; Thomas Construction Co., Fresno, $219,473; Parish Bros., Benicia, $226,175; Al Erickson & Co. and Huntington Bros., Napa, $231,855. Contract awarded to Brown-Ely Co., Contractors, Corte Madera, $183,225.25.

MENDOCINO COUNTY—Across Indian Creek, about 5 miles northwest of Boonville, a reinforced concrete box girder bridge to be constructed, and approaches about 0.21 mile in length, to be surfaced with road-mixed surfacing and seal coats applied thereto. District I, Route 48, Section B. Tumblin Co., Bakersfield, $127,629; R. G. Clifford & C. O. Bodenhamer, Berkeley, $142,858; E. A. Forde Co., San Anselmo, $156,104; O'Connor Bros., Red Bluff, $158,377; Bos Construction Co., Oakland, $158,384; D. M. Sandling, San Pablo, $158,411; Eaton & Smith, San Francisco, $169,768. Contract awarded to Transocean Engineering Corp., San Lorenzo, $117,771.10.

MENDOCINO COUNTY—Across Russian River and over the tracks of the Northwestern Pacific Railroad Co., about 1.4 miles south of Hopland, two existing steel bridges to be cleaned and painted. District I, Route 1, Section L. D. Zelinsky & Sons, San Francisco, $22,769; R. W. Reade & Co., Berkeley, $23,272; J. S. Morris Co., Berkeley, $23,330; Klaas Bros., Los Angeles, $33,286; D. E. Burgess Co., San Francisco, $34,134; J. P. Carroll Co., Los Angeles, $51,074. Contract awarded to Ken Thurston, Santa Rosa, $17,980.

MENDOCINO COUNTY—At two locations between Boonville and 0.9 mile east of Shearing Creek, about 1.3 miles, to be graded and surfaced with road-mixed surfacing on cement treated base. District I, Route 48, Sections B, A. C. W. Peterson, North Hollywood, $155,811; Harms Bros., Sacramento, $157,784; Gordon H. Ball and San Ramon Valley Land Co., Berkeley, $166,140; Close Building Supply, Inc., Hayward, $167,808; Claude C. Wood Co., Lodi, $172,840; J. Henry Harris, Berkeley, $207,154. Contract awarded to Arthur B. Siri, Inc., Santa Rosa, $130,008.

MENDOCINO COUNTY — Across Mill Creek, about 11 miles northwest of Boonville, a portion of a bridge to be repaired. District I, Route 48, Section B. Ted Schwartz, Grass Valley, $16,990; D. M. Sandling, San Pablo, $20,828; Bos Construction Co., Oakland, $21,088; Charles S. Moore & Robert R. Murdoch, Oakland, $21,355; R. G. Clifford & C. O. Bodenhamer, Berkeley, $21,882; Al Erickson & Co., Napa, $23,068; James H. McFarland, San Francisco, $25,311; Laredon Construction Co., Los Angeles, $27,313; Tumblin Co., Bakersfield, $31,240. Contract awarded to R. E. Hertel, Sacramento, $15,892.

MENDOCINO COUNTY — Across Big River about 12.4 miles south of Fort Bragg, a steel plate girder bridge and timber railing to be cleaned and painted. District I, Route 56, Section D. R. W. Reade & Co., Berkeley, $8,336. Contract awarded to J. S. Morris Co., Berkeley, $7,920.

MONTEREY COUNTY—Between Chualar and Spence Underpass about 5.2 miles, to be surfaced with plant-mixed surfacing on cement treated, imported base material and seal coats applied. District V, Route 2, Section B. Granite Construction Co., Watsonville, $397,712; Fredrickson & Watson Construction Co., Oakland, $407,701. Contract awarded to Rice Brothers, Inc., Marysville, $379,848.85.

MONTEREY COUNTY—Across Salinas River, at King City, an existing steel truss bridge to be cleaned and painted. District V, Route 2, Section F. J. P. Carroll Co., Los Angeles, $29,400; D. Zelinsky & Sons, San Francisco, $38,717; H. C. McKern, San Jose, $39,214; R. W. Reade & Co., Berkeley, $44,133; Klaas Brothers, Los Angeles, $45,600; Deemer & Deemer, San Francisco, $47,220; J. P. McGuire, Painting Co., San Jose, $47,962. Contract awarded to J. S. Morris Co., Berkeley, $27,777.

ORANGE COUNTY—On Ortega Highway, portions between Zaza Creek and Fernwood Creek, eight cattle passes to be reconstructed. District VII, Route 64, Sections A, B. Hubbs Equipment Co., Colton, $88,345; Thomas Construction Co., Fresno, $95,000; N. M. Saliba Company, Los Angeles, $103,870; E. F. Grandy, Laguna Beach, $105,008; E. S. & N. S. Johnson, Fullerton, $105,356; E. G. Perham, Los Angeles, $109,835; Walter H. Barber & H. R. Breeden, La Mesa, $111,515; C. W. Peterson, North Hollywood, $124,890. Contract awarded to Arthur A. Johnson, Laguna Beach, $87,036.

ORANGE COUNTY—On Santa Ana Freeway, between 0.25 mile westerly of Los Angeles Street and Orangewood Avenue, about 1.2 miles, roadways for a 4-lane divided highway with frontage roads and interchange connections to be graded and surfaced, with Portland cement concrete pavement on cement treated subgrade and plant-mixed surfacing on untreated rock base and two grade separation structures to be constructed. District VII, Routes 174.2; Sections A, D. MacDonald & Kruse, Sun Valley, $770,778; A. Teichert & Son, Inc., Sacramento, $772,693; Winston Bros. Company, Monrovia, $785,957; Guy F. Atkinson Co., Long Beach, $808,750; J. E. Haddock, Ltd., Pasadena, $825,272; Griffith Co., Los Angeles, $861,700. Contract awarded to Webb & White, Los Angeles, $764,976.75.

PLUMAS AND LASSEN COUNTIES—Between Beckwourth Pass and Route 29, about 4.2 miles, to be graded and surfaced with plant-mixed surfacing on cement treated base and a railroad overhead to be constructed. District II, Route 21, Sections G, A. H. Earl Parker, Inc. & Harms Bros., Sacramento, $428,939; Richter Bros., Oroville, $451,476; A. Teichert & Son, Inc., Sacramento, $454,619; Granite Construction Co., Watsonville, $465,702. Contract awarded to Eaton & Smith, San Francisco, $407,251.80.

RIVERSIDE COUNTY — At the intersection of Routes 19 and 194, about 15 miles east of the City of Riverside, existing roadbed to be widened and surfaced with plant-mixed surfacing. District VIII, Routes 19, 194, Sections D, C. George Herz & Co., San Bernardino, $13,035; Matich Bros., Colton, $13,055; R. A. Erwin, Colton, $13,412. Contract awarded to E. L. Yeager Co., Riverside, $11,621.50.

SACRAMENTO COUNTY—At the intersections of Auburn Boulevard with Fulton Avenue and Watt Avenue, full traffic-actuated signal systems and highway lighting to be furnished and installed and channelization to be constructed. District III, Route 3, Section B. R. Goold & Son, Stockton, $43,994; Grason Electric Co., Sacramento, $44,371; Howard Electric Co., Gilroy, $44,751; R. Flatland, San Francisco, $45,870; Reliable Elevator Works, Sacramento, $46,510; Underground Electric Construction Co., Oakland, $49,131. Contract awarded to L. H. Leonardi Electric Construction Co., San Rafael, $39,711.

SACRAMENTO COUNTY—At the intersections of Auburn Boulevard with Fulton Avenue and with Watt Avenue, channelization to be constructed. District III, Route 3, Section B. Brighton Sand & Gravel Co., Sacramento, $26,868. Contract awarded to A. Teichert & Son, Inc., Sacramento, $24,438.50.

SACRAMENTO-PLACER COUNTIES—Between Sylvan School and Roseville, about 2.9 miles, existing borders to be trenched and surfaced with plant-mixed surfacing on untreated rock base. District III, Route 3, Sections B, A, A. A. Teichert & Son, Inc., Sacramento, $54,129; O'Connor Bros., Red Bluff, $58,428; Brighton Sand & Gravel Co., Sacramento, $65,220; J. R. Reeves, Sacramento, $66,775. Contract awarded to McGilivray Construction Co., Sacramento, $52,819.

SAN BERNARDINO COUNTY—Between Lytle Creek and west city limits of San Bernardino, about 0.3 mile, to be widened and resurfaced with plant-mixed surfacing and installing highway lighting system. District VIII, Route 9, Section C. Matich Bros. & Matich Bros. Paving Co., Colton, $20,074; R. A. Erwin, Colton, $20,861; E. L. Yeager Co., Riverside, $23,566. Contract awarded to George Herz & Co., San Bernardino, $18,396.09.

SAN BERNARDINO COUNTY—In the City of San Bernardino at the intersection of Highland Avenue with Waterman Avenue, traffic signal system and highway lighting to be furnished and installed and signal systems to be interconnected. District VIII, Route 190. Paul R. Gardner, Ontario, $5,233; Harry F. Brewer, Long Beach, $5,567; C. D. Draucker, Inc., Los Angeles, $6,574. Contract awarded to Fischbach & Moore, Los Angeles, $5,173.

SAN BERNARDINO COUNTY—Across Etiwanda-San Devaine Flood Control Channel, about 8 miles east of Ontario, a reinforced contrete girder bridge to be constructed. District VIII, Route 26, Section D. Stuckey & Carroll Construction Co., El Monte, $132,139; O. B. Pierson, Bellflower, $136,481; George Herz & Co., San Bernardino, $137,520; Dimmitt & Taylor, Monrovia, $138,998; E. L. Yeager & Co., Riverside, $139,642; John Strona, Pomona, $140,832; K. B. Nicholas, Ontario, $143,208; Thomas Construction Co., Fresno, $148,176; J. E. Haddock, Ltd., Pasadena, $151,176; E. S. & N. S. Johnson, Fullerton, $153,130; Hubbs Equipment Co. and Baker Construction Co., Colton, $153,138; C. B. Tuttle Co., Long Beach, $157,545; N. M. Saliba Co., Los Angeles, $173,367; Byerts & Sons and Geo. K. Thatcher, Los Angeles, $210,513. Contract awarded to Lars Oberg, Los Angeles, $126,004.

SAN BERNARDINO COUNTY — Between Los Angeles County line and Ontario, about 2.1 miles, the existing roadbed to be resurfaced with plant-mixed surfacing. District VIII, Route 26, Section C. Vido Kovacevich, South Gate, $44,056; Matich Brothers, Colton, $45,742; R. A. Erwin, Colton, $46,110; E. L. Yeager Co., Riverside, $47,446; J. E. Haddock, Ltd., Pasadena, $47,623; Griffith Co., Los Angeles $48,895; Warren Southwest, Inc., Torrance, $50,768; Vernon Paving Co., Los Angeles, $52,706. Contract awarded to George Herz & Co., San Bernardino, $43,989.

SAN BERNARDINO COUNTY—Between Barstow and Daggett, about 8.1 miles, the roadbed to be widened and portions resurfaced with plant-mixed surfacing. District VIII, Route 58, Sections Bsw, E, F. Vernon Paving Co., Los Angeles, $101,711; Rice Brothers, Inc., Marysville, $104,949; Griffith Company, Los Angeles, $109,448; Oilfields Trucking Co. and Phoenix Construction Co., Inc., Bakersfield, $109,870; R. A. Erwin, Colton, $109,915; A. Teichert & Son, Inc., Sacramento, $129,825; Fredericksen & Kasler, Sacramento, $131,336; G. W. Ellis, Construction Co., North Hollywood, $137,305. Contract awarded to Peter Kiewit Sons Co., Arcadia, $92,618.

SAN DIEGO COUNTY—Across San Diego River in the City of San Diego, portions of an existing steel plate girder bridge to be cleaned and painted. District XI, Route 2. Geo. C. Punton, Chula Vista, $19,143; Acme Maintenance Engineering Company, Montebello, $26,830; Gaytan & Leiher, Los Angeles, $38,400. Contract awarded to H. W. Kirch & Co., Vista, $12,800.

SAN DIEGO COUNTY—Between 2.2 miles south of Carlsbad and Buena Vista Creek, about 4.4 miles in length, constructing graded roadbeds; surfacing the freeway with Portland cement concrete pavement on cement treated subgrade; surface frontage roads, ramps and intersecting streets and roads with plant-mixed surfacing on cement treated base and on selected material; and applying seal coats thereto; and constructing two reinforced concrete bridges; and overhead over the tracks of the A. T. & S. F. Rwy, a pedestrian undercrossing and six grade separation structures. District XI, Route 2, Section B. A. Teichert & Son, Inc., Sacramento, $2,281,380; Griffith Co., Los Angeles, $2,331,662; Peter Kiewit Sons Co., Arcadia, $2,392,533; J. A. Payton & Bent Construction Co., Los Angeles, $2,412,698; Daley Corp., San Diego, $2,433,928; Clyde W. Wood & Sons, Inc., W. J. Disteli, R. E. Hazard Contracting Co. & C. G. Willis & Sons, San Diego, $2,454,606; Ball & Simpson & Earl Parker, Inc., Berkeley, $2,497,640; Guy F. Atkinson Co., Long Beach, $2,526,218; Cox Bros. Construction Co. & Allison Honer Co., Santa Ana, $2,532,000. Contract awarded to Bressi & Bevanda Constructors, Inc., North Hollywood, $2,238,685.50.

SAN FRANCISCO COUNTY—On Park Presidio Boulevard, between Lake Street and Golden Gate Bridge viaduct, highway lighting and sign lighting systems to be modified. District IV, Route 56. L. H. Leonardi Electric Construction Co., San Rafael, $16,670; Ets-Hokin & Galvan, San Francisco, $17,221; R. Flatland, San Francisco, $17,447; Manning & Whitaker, Inc., San Francisco, $17,548; Abbett Electric Corp., San Francisco, $21,950; George F. Brayer, San Francisco, $28,455. Contract awarded to H. S. Tittle Co., San Francisco, $13,178.

SAN JOAQUIN AND STANISLAUS COUNTIES—Between junction with Route 41 and 6.5 miles west of Modesto, about 7.9 miles, to be surfaced with plant-mixed surfacing on untreated rock base. District X, Route 110, Sections A, A, B. A. Teichert & Son, Inc., Sacramento, $255,574; Oilfields Trucking Co. & Phoenix Construction Co., Inc., Bakersfield, $257,258; Clements & Co., Hayward, $296,185; Munn & Perkins, Modesto, $298,000; Granite Construction Co., Watsonville, $315,000; M. J. B. Construction Co., Stockton, $336,239; Harms Bros., Sacramento, $341,184; G. W. Ellis Construction Co., North Hollywood, $348,734. Contract awarded to M. J. Ruddy & Son, Modesto, $254,129.40.

SAN MATEO COUNTY—Between 25th Avenue and 41st Avenue, in the City of San Mateo, about 1 mile, to be widened with imported subbase material and cement treated base and surfaced with plant-mixed surfacing on existing pavement and cement treated base. District IV, Route 2. Frank W. Smith, Inc., San Mateo, $85,541; J. Henry Harris, Berkeley, $94,854; McCammon-Wunderlich Co. & Freeman Paving Co., Palo Alto, $97,693; Clements & Co., Hayward, $101,711. Contract awarded to L. C. Smith Co., San Mateo, $78,957.40.

SAN MATEO COUNTY—On Bayshore Freeway, between Colma Creek and Broadway, about 5.1 miles, to be resurfaced with plant-mixed surfacing. District IV, Route 68, Section SSF, F, Mlbf, Burl.

Eaton & Smith, San Francisco, $262,226; Leo F. Piazza Paving Co., San Jose, $274,975; Chas. L. Harney, Inc., San Francisco, $278,673; Clements & Co., Hayward, $281,712; The Lowrie Paving Co., Inc., San Francisco, $284,885; J. Henry Harris, Berkeley, $293,951; Guy F. Atkinson Co., South San Francisco, $295,910; Fredrickson & Watson Construction Co., Oakland, $299,222; Granite Construction Co., Watsonville, $302,547; McCammon-Wunderlich Co. & Freeman Paving Co., Palo Alto, $319,828; The Fay Improvement Co., San Francisco, $324,268. Contract awarded to L. C. Smith Co., San Mateo, $245,718.75.

SANTA BARBARA COUNTY—Between Gaviota and Gaviota Gorge, about 3.2 miles to be graded and surfaced with plant-mixed surfacing on cement treated base, a reinforced concrete bridge to be widened and another to be superelevated. District V, Route 2, Section E. Eaton & Smith, San Francisco, $1,247,777; A. Teichert & Son, Inc., Sacramento, $1,326,244; J. E. Haddock, Ltd., Pasadena, $1,394,-802; Granite Construction Co., Watsonville, $1,436,-601. Contract awarded to Clyde W. Wood & Sons, Inc., North Hollywood, $1,200,700.

SAN MATEO COUNTY—Between the north city limits and 0.1 mile south of the south city limits of San Mateo, about 2.6 miles to be graded and paved with Portland cement concrete pavement on cement treated subgrade and separation structures to be constructed. District IV, Route 68, Section SM, C. Peter Kiewit Sons Co., Arcadia, $1,683,481; Chas L. Harney, Inc., San Francisco, $1,683,693; Eaton & Smith, San Francisco, $1,691,438; Guy F. Atkinson Company, South San Francisco, $1,732,-764. Contract awarded to Piombo Construction Co., San Francisco, $1,673,277.80.

SANTA BARBARA COUNTY—Portions between 1.7 miles east of Buckhorn Creek and 0.5 mile east of Clear Creek, about 0.4 mile to be graded by widening five curves, and guard railing to be installed. District V, Route 57, Section B. R. C. Downer, Reno, $32,770; Thomas Construction Co., Fresno, $39,147; C. W. Peterson, North Hollywood, $40,-563; Granite Construction Co., Watsonville, $47,-261; Valley Paving & Construction Co., Inc., Pismo Beach, $49,285. Contract awarded to Hermreck & Easter, Santa Maria, $29,983.50.

SANTA BARBARA COUNTY—Over San Roque Canyon in the City of Santa Barbara, an existing steel bridge to be cleaned and painted. District V, Route 80. Nels P. Christensen Painting Co., Santa Barbara, $19,328; Gaytan & Leiher, Los Angeles, $19,764; J. S. Morris Co., Berkeley, $19,940; J. P. McGuire Painting Co., San Jose, $24,403. Contract awarded to Klaas Brothers, Los Angeles, $14,700.

SANTA CLARA COUNTY—Between Ferguson Road and 5 miles east of Gilroy, about 2 miles to be surfaced with plant-mixed surfacing on the existing surfacing, plant-mixed surfacing on untreated rock base over the existing surfacing, and shoulders to be constructed. District IV, Route 32, Section A. Browne and Krull, Hayward, $92,122; Granite Construction Co., Watsonville, $95,778. Contract awarded to Fredrickson & Watson Construction Co., Oakland, $82,827.60.

SANTA CRUZ COUNTY—Across Fall Creek, about 6.4 miles north of Santa Cruz, a timber bridge to be repaired. District IV, Route 116, Section A. R. G. Clifford and C. O. Bodenhamer, Berkeley, $16,929; Bos Construction Co., Oakland, $19,764; Barton Construction Co., Oakland, $21,040; James H. McFarland, San Francisco, $25,694; Granite Construction Co., Watsonville, $26,308. Contract awarded to Charles S. Moore & Robert R. Murdoch, Oakland, $15,353.

SANTA CRUZ COUNTY — Between Boulder Creek and Waterman Gap, about 4.7 miles to be surfaced with plant-mixed surfacing on imported base material. District IV, Route 116, Sections A, B. Glements & Co., Hayward, $325,676; J. Henry Harris, Berkeley, $352,053; Leo F. Piazza Paving Co., San Jose, $368,725. Contract awarded to Granite Construction Co., Watsonville, $257,943.

SISKIYOU COUNTY — Across Oak Flat Creek, 6.9 miles west of Happy Camp, a reinforced concrete bridge to be constructed. District II, Route 46, Section A. B. S. McElderry, Berkeley, $41,420. Contract awarded to A. A. Edmondson, San Fernando, $31,904.

SOLANO COUNTY—Between 2.5 miles north of Vacaville and Midway, about 2.5 miles, borders, shoulders and base to be constructed of untreated rock base and the central portion of the roadbed to be surfaced with plant-mixed surfacing. District X, Route 7, Section D. Fredrickson Bros., Emeryville, $125,216; Harms Bros., Sacramento, $130,209; Parish Bros., Benecia, $155,040; J. Henry Harris, Berkeley, $160,120. Contract awarded to A. Teichert & Son, Inc., Sacramento, $122,748.

SONOMA COUNTY—Across Russian River and Austin Creek at Guerneville and about 7.2 miles west, two existing steel bridges to be cleaned and painted. District IV, Route 104, Sections B, A. J. S. Morris Co., Berkeley, $21,080; Deemer & Deemer, San Francisco, $24,000; Bill Reid Painting Service, Sacramento, $27,434; D. Zelinsky & Sons, San Francisco, $26,000. Contract awarded to R. W. Reade & Co., Berkeley, $19,743.

TRINITY COUNTY—Across Big French Creek, 27 miles west of Weaverville, a reinforced concrete bridge to be constructed. District I, Route 20, Section D. Tumblin Co., Bakersfield, $34,650; James H. McFarland, San Francisco, $35,915; Al Erickson & Co., Napa, $36,881; Ted Schwartz, Grass Valley, $36,950; B. S. McElderry, Berkeley, $37,780; R. G. Clifford and C. O. Bodenhamer, Berkeley, $38,060; H. H. Anderson, San Leandro, $38,511; Bos Construction Co., Oakland, $39,715; R. E. Hertel, Sacramento, $44,610; Nomellini Construction Co., Stockton, $44,850; O'Connor Bros., Red Bluff, $45,-700. Contract awarded to Laredon Construction Co., Hollywood, $33,100.

TRINITY COUNTY—Across South Fork of Trinity River, 22.2 miles west of Hayfork, the superstructure of an existing steel truss bridge to be removed and to be replaced with a superstructure consisting of revised structural steel girders and a new timber deck. District I, Route 35, Section A. A. C. Johnson & Sons, Eureka, $60,444; Bos Construction Co., Oakland, $61,957; B. S. McElderry, Berkeley, $64,822; Judson Pacific-Murphy Corp., Emeryville, $66,206; LeBoeuf-Dougherty Contracting Co., Richmond, $68,606; Commercial Construction Co., Marysville, $77,172. Contract awarded to Laredon Construction Co., Los Angeles, $50,990.

TULARE COUNTY — Between Tulare Airport and Tagus, six overcrossings to be constructed, portions of a roadway for a divided highway, connecting roads, frontage roads and approach ramps to be graded and imported base material and plant-mixed surfacing to be placed on designated ramps, connecting roads and frontage roads. District VI, Route 4, Sections B, Tul, F. Griffith Co., Los Angeles, $903,-904; C. K. Moseman, Redwood City, $965,113; Ralph A. Bell, Monrovia, $974,611; Guy F. Atkinson Co., South San Francisco, $1,017,186. Contract awarded to Gordon H. Ball and San Ramon Valley Land Co. and Trewhitt, Shields & Fisher, Fresno, $857,980.60.

VENTURA COUNTY—On Ventura Boulevard at the Montalvo Truck Scales, about 0.5 mile to be graded and surfaced with plant-mixed surfacing on cement treated base. District VII, Route 2, Section C. Contract awarded to Baker & Pollock, Ventura, $35,-949.70.

F. A. S. County Routes

EL DORADO COUNTY—Between Chiquita and 2.1 miles southeasterly, about 2.1 miles to be graded, imported base material to be placed and bituminous surface treatment to be applied. District III, Route 1099. C. V. Kenworthy, Stockton, $114,063; Joe Vicini, Placerville, $125,626; Cecil L. Moore, San Leandro, $134,580; Ball & Simpson, & T. E. Irving, Berkeley, $146,106; M. W. Brown, Redding, $146,-674; T. M. Montgomery, Auburn, $152,251; Claude C. Wood Co., Lodi, $162,748; Huntington Bros., Napa, $190,476. Contract awarded to C. W. Peterson, North Hollywood, $104,305.

MENDOCINO COUNTY—On Willits-Fort Bragg Road, between 10 miles west of Willits and 6.9 miles west of Willits, about 3.1 miles to be graded. District I, Route 982. John Burman & Sons, Eureka, $107,780; Cecil L. Moore, San Leandro, $128,990; H. A. Christie Co., Inc., Ukiah, $129,306; W. H. O'Hair Co., Colusa, $130,820; Gordon H. Ball and San Ramon Valley Land Co., Berkeley, $136,865; Huntington Bros., Napa, $137,177; Harms Bros., Sacramento, $146,210; C. V. Kenworthy, Stockton, $151,659; T. M. Montgomery, Auburn, $164,863; Arthur B. Siri, Inc., Santa Rosa, $166,000; Transocean Engineering Corp., San Lorenzo, $171,496; McCammon-Wunderlich Co., Palo Alto, $186,777; Humboldt Constructors, Inc., Eureka, $197,712; C. W. Peterson, North Hollywood, $214,186. Contract awarded to Macal Improvement Co., Inc., Antioch, $102,261.50.

STANISLAUS COUNTY—On Santa Fe Avenue and Geer Road between one mile south of Empire and Monte Vista Road, about 7.6 miles, a portion to be surfaced with plant-mixed surfacing on untreated rock base and a portion to be widened with untreated rock base and resurfaced with plant-mixed surfacing. District X, Routes 912, 914. M. J. Ruddy & Son, Modesto, $139,037; Harms Bros., Sacramento, $166,803. Contract awarded to United Concrete Pipe Corp., Baldwin Park, $125,124.50.

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ALAMEDA COUNTY—Between Castro Street and San Lorenzo Creek, about 0.7 mile in length, a six-lane divided highway on portions to be graded and surfaced with plant-mixed surfacing on cement treated base; existing pavement to be widened on other portions and surfaced with plant-mixed surfacing on cement treated base and on existing pavement; street connections and transitions to be graded and surfaced with plant-mixed surfacing on existing pavement and on various types of base; miscellaneous drainage structures to be constructed and highway lighting and traffic signal facilities to be furnished and installed, to provide a six-lane divided highway. District IV, Route 5. Fredrickson & Watson Construction Co.-M & K Corp., Oakland, $294,580; Close Building Supply, Inc., Hayward, $294,843; Lee J. Immel, San Pablo, $299,083; Silva Brothers, Hayward, $310,627; J. Henry Harris, Berkeley, $331,895. Contract awarded to Chas. L. Harney, Inc., San Francisco, $288,336.80.

BUTTE COUNTY—Between 3.8 miles north of Oroville Wye and 20th Street in Chico, about 14.9 miles, to be graded and portions surfaced with plant-mixed surfacing on untreated rock base and a highway lighting system to be installed. District III, Route 3, Sections B, C, Chc. H. Earl Parker, Inc., Marysville, $795,706; Eaton & Smith, San Francisco, $844,488; Guy F. Atkinson Co., South San Francisco, $851,331; McCammon-Wunderlich Co., Palo Alto, $856,808; Harms Bros., Sacramento, $903,514; Fredrickson Bros., Emeryville, $909,030; B. J. Ukropina, T. P. Polich, Steve Kral, Baldwin Park, $944,072; Ball and Simpson, Berkeley, $1,078,434; Granite Construction Co., Watsonville, $1,238,378. Contract awarded to Richter Bros., Oroville, $694,774.

CONTRA COSTA COUNTY—At the Southern Pacific Railroad crossing in Danville, about 0.2 mile, turnout lanes to be constructed of plant-mixed surfacing on cement treated base material and seal coat applied. District IV, Route 107, Section A. Lee J. Immel, San Pablo, $14,455; O. C. Jones & Sons, Berkeley, $15,974; John B. Paroline, Morgan Hill, $16,171; J. Henry Harris, Berkeley, $16,341. Contract awarded to J. R. Armstrong, El Cerrito, $11,-680.04.

GLENN COUNTY—Across Stony Creek, about 0.8 mile north of Orland, the existing concrete arch bridge to be widened. District III, Route 7, Section C. Bos Construction Co., Oakland, $62,264; R. E. Hertel, Sacramento, $77,383; B. S. McElderry, Berkeley, $84,438; O'Connor Bros., Red Bluff, $105,008. Contract awarded to R. G. Clifford and C. O. Bodenhamer, Berkeley, $60,624.

IMPERIAL COUNTY—Between 1.5 miles west of Coyote Wells and 0.5 mile west of Plaster City, about 5.2 miles, road-mixed surfacing to be placed over existing surfacing and seal coats applied. District XI, Route 12, Sections A,B. Slaughter and Young, Julian, $53,006; Verne MacArthur, La Crescenta, $54,455; Clyde W. Wood & Sons, Inc., North Hollywood, $56,903; Oilfields Trucking Co. and Phoenix Construction Co., Inc., Bakersfield, $58,036; Basich Bros. Construction Co., N. L. Basich and R. L. Basich. Garvey, $61,139; R. P. Shea Company, Indio, $65,-440; Einer Bros., Inc., Escondido, $73,473. Contract awarded to Marks Brothers Construction Co., El Cerrito, $49,673.20.

INYO COUNTY—Between the south city limits of Bishop and Texaco Corners, about 1.5 miles to be widened, imported subbase material and untreated rock base to be placed and plant-mixed surfacing to

be placed over new base and existing surfacing. District IX, Routes 23, 76, Sections Bis,E,A. Basich Bros. Construction Co., N. L. and R. L. Basich, Garvey, $152,912. Contract awarded to G. W. Ellis Construction Co., North Hollywood, $148,868.30.

KERN COUNTY—Between 0.8 mile and 4.3 miles east of Mojave, about 3.5 miles of roadway to be graded, imported subbase and base materials to be placed, and surfaced with plant-mixed surfacing. District IX, Route 58, Section A. R. R. Hensler, Sun Valley, $164,220; G. W. Ellis Construction Co., North Hollywood, $169,696; Volpa Bros., Fresno, $176,898; Osborn Co., Pasadena, $212,636. Contract awarded to Oilfields Trucking Co. and Phoenix Construction Co., Inc., Bakersfield, $159,456.15.

KINGS COUNTY—Between east city limits of Corcoran and the A. T. & S. Fe railroad crossing, Tulare branch, two bridges to be widened and about 2.6 miles of highway to be resurfaced with plant-mixed surfacing. District VI, Route 134, Section A. Baun Construction Co., Fresno, $52,081. Contract awarded to Griffith Co., Los Angeles, $49,118.50.

PLACER COUNTY—City of Roseville, at the intersection of Vernon Street with Riverside Avenue-Douglas Street, Judah Street, Grant Street and Lincoln Street, traffic signal system with highway lighting and channelization to be furnished and installed and constructed at one intersection, traffic signal system and highway lighting to be furnished and installed at two intersections, and traffic signal system to be modified at one intersection. District III, Routes 3,17. Reliable Elevator Works, Sacramento, $21,668; Underground Electric Construction Co., Oakland, $22,222; L. H. Leonardi Electric Construction Co., San Rafael, $22,336; R. Flatland, San Francisco, $23,165; Howard Electric Co., Gilroy, $24,551. Contract awarded to R. Goold & Son, Stockton, $21,182.

LAKE COUNTY—Between 0.4 mile south of Lower Lake and 0.3 mile north of Cache Creek, about 1.7 miles to be graded and surfaced with imported base material (cement treated) and a seal coat applied thereto. District I, Route 49, Sections B,C. Close Building Supply, Inc., Hayward, $194,292; Eaton and Smith, San Francisco, $197,812; Huntington Bros., Napa, $206,194; Harms Bros., Sacramento, $210,058; O'Connor Bros., Red Bluff, $222,701. Contract awarded to Arthur B. Siri, Inc., Santa Rosa, $183,152.

LOS ANGELES COUNTY—At the intersections of Verdugo Road with Maple Street and with Acacia Avenue and Colorado Street with Louise Street, in the City of Glendale, traffic signal systems and highway lighting at two intersections and traffic signal system at one intersection. District VII, Routes 61,161. Harry F. Brewer, Long Beach, $16,789; C. D. Draucker, Inc., Los Angeles, $16,833; Fischback and Moore, Inc., Los Angeles, $17,936. Contract awarded to Westates Electrical Construction Co., Los Angeles, $15,628.

LOS ANGELES COUNTY—On Colorado Freeway in the City of Pasadena, between Orange Grove Avenue and Holly Street, about 0.3 mile to be graded and paved with plant-mixed surfacing and construction of a reinforced concrete box girder overcrossing. District VII, Route 161. J. E. Haddock, Ltd., Pasadena, $253,761; Fredericksen & Kasler, Sacramento, $265,013; Clifford C. Bong & Co., Arcadia, $269,760; J. A. Thompson & Son, Contractors, Inglewood, $280,542; Warren Southwest, Inc., Torrance, $299,173; Oberg Bros. Construction Co., Inglewood, $332,891. Contract awarded to Guy F. Atkinson Company, Long Beach, $234,479.

KINGS-TULARE COUNTY—Furnishing and installing highway lighting systems between one mile north of Corcoran and ¾ mile southeasterly of the Kings-Tulare County line. District VI, Route 135, Sections B,A. Dale Electric, Fresno, $7,580; L. H. Leonardi Electrical Construction Co., San Rafael, $8,228; Robinson Electric, Fresno, $8,956. Contract awarded to R. O. Ferguson Co., Visalia, $6,772.39.

MERCED COUNTY—Across Merced River, about 1.2 miles north of Livingston, a slab and girder bridge of reinforced concrete and structural steel to be widened. District X, Route 4, Section D. Chas. L. Harney, Inc., San Francisco, $412,728; Tumblin Co., Bakersfield, $425,853; Granite Construction Co., Watsonville, $431,774; Guy F. Atkinson Co., South San Francisco, $437,690; Trewhitt, Shields & Fisher, Fresno, $459,818; B. J. Ukropina, T. P. Polich, Steve Kral, Baldwin Park, $469,323; Macco Corp., Paramount, $481,167; Nomellini Construction Co., Stockton, $506,905. Contract awarded to C. K. Moseman, Redwood City, $390,609.50.

MONO COUNTY—Between 4.4 miles north and 5.0 miles north of Coleville, about 0.6 mile of roadway to be graded, surfaced with bituminous surface treatment and a seal coat applied thereto. District IX, Route 95, Section A. Bishop Engineering and Construction Co., Bishop, $39,200; Harms Bros., Sacramento, $43,849. Contract awarded to Robert C. Downer, Reno, Nev., $36,119.

RIVERSIDE COUNTY—Between Indio and Black Butte, about 11.1 miles, plant-mixed surfacing to be placed over existing roadbed and seal coat applied; and about 55 miles of seal coat to be applied to existing surface. District XI, Route 64, Sections H,I,B,C,D. G. W. Ellis Construction Co., North Hollywood, $203,428; Peter Kiewit Sons' Co., Arcadia, $231,782. Contract awarded to Basich Bros. Construction Co., N. L. Bacich and R. L. Basich, Garvey, $193,754.

RIVERSIDE COUNTY—In the City of Corona, between Ontario Avenue and north city limits, about 2.7 miles to be resurfaced with plant-mixed surfacing. District XIII, Routes 77,193. R. A. Erwin, Colton, $69,968; E. L. Yeager Co., Riverside, $72,006; Matich Bros., Colton, $74,025. Contract awarded to A. Teichert & Son, Inc., Sacramento, $59,623.

RIVERSIDE COUNTY—Lemay Creek and Rockhaven Creek, 1.3 miles northwest and 1.8 miles southeast of Aguanga, a reinforced concrete cattlepass and pipe culvert to be constructed. District VIII, Route 78, Section A. Thomas Construction Co., Fresno, $23,319; H. R. Breeden, Compton, $23,809; Einer Bros. Inc., Escondido, $23,977; E. S. and N. S. Johnson, Fullerton, $26,758; E. L. Yeager Co., Riverside, $29,631. Contract awarded to E. G. Perham, Los Angeles, $19,557.50.

SACRAMENTO COUNTY—Under the tracks of the Southern Pacific Co. at B Street and Elvas Wye, in and near the city of Sacramento, two underpasses to be constructed. District III, Route 98. B. J. Ukropina, T. P. Polich, Steve Kral, Baldwin Park, $916,821; A. Teichert & Son, Inc., Sacramento, $927,886; Lord & Bishop, Sacramento, $932,632; C. K. Moseman, Redwood City, $945,989; Peter Kiewit Sons Co., Arcadia, $990,881; Williams & Burrows, Inc., and Carl N. Swenson Co. Inc., San Jose, $992,697; Guy F. Atkinson Co., South San Francisco, $996,951; George Pollack Co., Sacramento, $1,035,183. Contract awarded to John C. Gist, Sacramento, $914,182.

SAN FRANCISCO AND ALAMEDA COUNTY—On San Francisco-Oakland Bay Bridge, upper deck painting scaffold (traveler) and track to be constructed. District IV, Route 68. Judson Pacific-Murphy Corp., Emeryville, $229,745; California Steel Products Co., Richmond, $241,877; Moore Dry Dock Co., Oakland, $269,915; Kyle Steel Construction Co., Vernon, $280,605; Chas. L. Harney, Inc., San Francisco, $299,800; American Bridge Division, United States Steel Co., San Francisco, $344,750. Contract awarded to Herrick Iron Works, Oakland, $209,800.

SAN JOAQUIN COUNTY—Across Stanislaus River, about 7 miles south of Manteca, and across Middle River, about 12 miles west of Stockton, two existing steel bridges to be cleaned and painted. District X, Routes 4,75, Sections A,A. D. Zelinsky & Sons, San Francisco, $30,981; Klaas Brothers, Los Angeles, $36,365; D. E. Burgess Co., San Francisco, $37,224; J. S. Morris Co., Berkeley, $37,650; John P. McGuire, San Jose, $41,394; R. W. Reade & Co., Berkeley, $43,404. Contract awarded to H. C. McKern, San Jose, $22,776.

SAN LUIS OBISPO COUNTY—In the City of San Luis Obispo, at Grand Avenue and Buena Vista Avenue, two reinforced concrete bridges to be constructed and streets to be graded and surfaced with plant-mixed surfacing on imported base material. District V, Route 2, Fredericksen & Kasler, Sacramento, $217,288; Granite Construction Co., Watsonville, $219,243; Madonna Construction Co., San Luis Obispo, $284,902. Contract awarded to Thomas Construction Co., Fresno, $207,126.75.

SISKIYOU COUNTY—Between Dunsmuir and Big Canyon, about 4.3 miles to be graded and surfaced with plant-mixed surfacing on cement treated base. District II, Route 3, Section A. Fredrickson & Watson Construction Co., Oakland, $1,128,009; B. J. Ukropina, T. P. Polich, Steve Kral, Baldwin Park, $1,133,023; H. Earl Parker, Inc., and Harms Bros., Sacramento, $1,143,156; Ball & Simpson, Berkeley, $1,164,521; Granite Construction Co., Watsonville, $1,166,665; Peter Kiewit Sons' Co., Arcadia, $1,239,901; McNutt Brothers, Eugene, Ore., $1,359,736; L. A. and R. S. Crow, El Monte, $1,437,692; McCammon-Wunderlich Co., Palo Alto, $1,990,743. Contract awarded to A. Teichert & Son, Inc., Sacramento, $1,048,738.50.

SOLANO COUNTY—Between Carquinez Bridge and Vallejo Wye, about 0.8 mile of existing roadbed to be reinforced with untreated rock base, surfaced with plant-mixed surfacing and seal coats applied. District X, Route 7, Section P. Lee J. Immel, San Pablo, $81,601; J. Henry Harris, Berkeley, $87,404; O. C. Jones & Sons, Berkeley, $90,648; Harms Bros., Sacramento, $90,847. Contract awarded to Parish Bros., Benicia, $80,166.40.

YOLO COUNTY—Across Sacramento River at Knight's Landing, for cleaning and painting a bridge. District III, Route 87, Section A. R. W. Reade & Co., Berkeley, $8,676; D. E. Burgess Co., San Francisco, $11,435; D. Zelinsky & Sons, San Francisco, $13,850; Bill Reid Painting Service, Sacramento, $13,877; R. A. Luther, Hayward, $14,474. Contract awarded to Judd Co., Inc., Oakland, $7,866.

F. A. S. County Projects

YUBA COUNTY—Between 5 miles east of Browns Valley and 0.9 mile east and between 7 miles east of Stanfield Hill and Frenchtown Road, about 2.8 miles to be graded, imported borrow placed and penetration treatment and seal coat applied. District III, Route 526. H. Earl Parker, Inc., Marysville, $114,433; O'Connor Bros., Red Bluff, $124,243; J. Henry Harris, Berkeley, $126,917. Contract awarded to Richter Bros., Oroville, $104,967.

GLENN COUNTY—Between State Route 7 and 4.6 miles east, about 4 miles south of Willows, imported base material to be placed over existing roadbed. District III, Route 1121. Huntington Bros., Napa, $59,720; W. H. O'Hair Co., Colusa, $59,844; Browne & Krull, Hayward, $60,900; Volpa Bros., Fresno, $62,120; M. J. Ruddy & Son, Modesto, $62,896; A. Teichert & Son, Inc., Sacramento, $64,940; Eugene G. Alves, Pittsburg, $68,050; Harms Bros., Sacramento, $71,212; Claude C. Wood Co., Lodi, $74,520; O'Connor Bros., Red Bluff, $76,020. Contract awarded to Lefever & Bing, West Sacramento, $57,240.

SAN JOAQUIN COUNTY—On Pacific Avenue, between 5-Mile House and Calaveras River, about 2.4 miles, to be graded and surfaced with plant-mixed surfacing on untreated rock base. District X, Route 543. S. M. McGaw Co., Inc., Stockton, $187,121; Claude C. Wood Co., Lodi, $191,435; Karl C. Harmeling, Stockton, $202,738. Contract awarded to A. Teichert & Son, Inc., Sacramento, $163,718.15.

In Memoriam

EUGENE NORMAN SAWTELLE

Eugene Norman Sawtelle, 59, employed by the Division of Water Resources for over 27 years, passed away on November 6, 1951, after a short illness. At the time of his death Mr. Sawtelle was in charge of a unit of delineators in the division's Bryte office, in connection with the state-wide water resources investigations. He leaves his widow, Grace Elliott Sawtelle, and a daughter, Rosemary.

EARL WARREN
Governor of California

•

FRANK B. DURKEE
Director of Public Works

•

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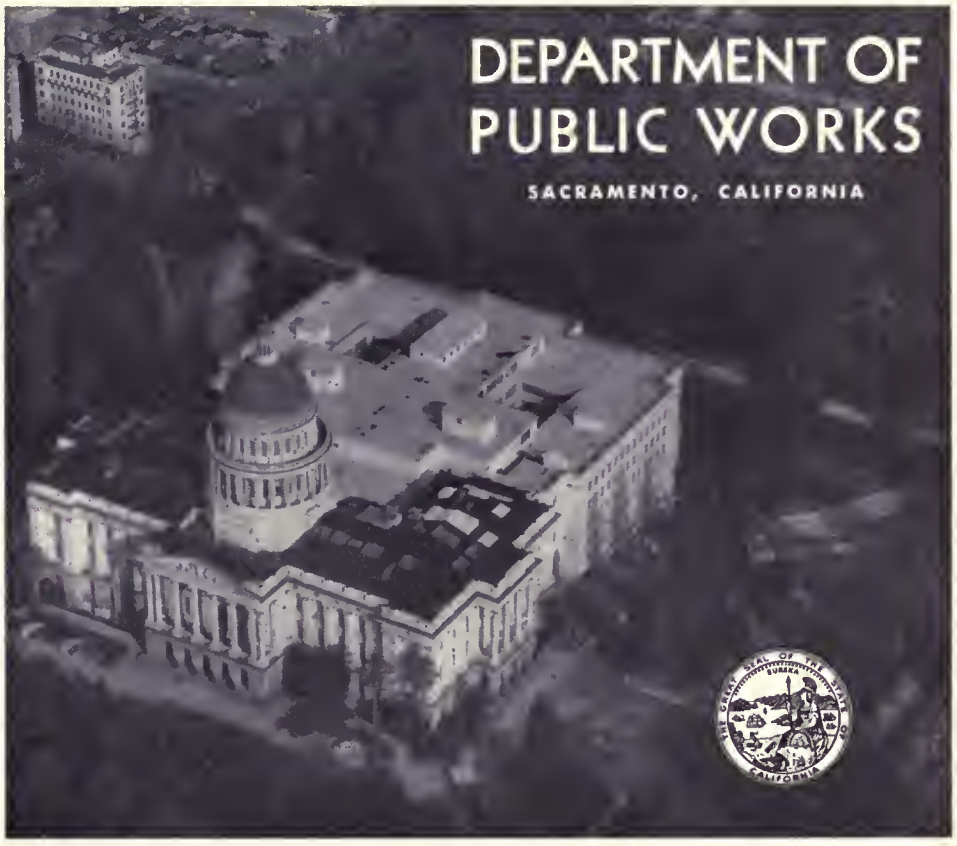
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AUG 25 1952

F.A.S. Highway Program in Los Angeles County

A Story of Careful Highway Planning and Execution

By C. W. SPROTTE, Los Angeles County Assistant Chief Deputy Road Commissioner

THE FEDERAL AID Secondary Program in the County of Los Angeles has been extremely successful. It has initiated, partially financed, and given impetus to the delineation and construction of a defined secondary highway feeder system. The establishment and improvement of this feeder system which is essential to the economic life of this area, has been implemented by federal aid secondary funds to such an extent that some of the bottlenecks on the existing routes have been removed. Much still remains to be done on these routes, but definite progress can be shown for the few years the program has been in operation.

The Federal Aid Highway Act of 1944 provided funds to assist the individual states in the construction of secondary and feeder roads including farm-to-market routes, rural free delivery mail, and public school routes which were either outside of municipalities or inside of municipalities of less than 5,000 population.

Cooperation

Federal regulations require that this secondary highway system be selected by the State Highway Department in cooperation with the county supervisors, county road commissioner and the Commissioner of Public Roads. The State Division of Highways, in accordance with the above directive, and its normal practice of allowing local governments as much freedom as possible in the determination of their needs, delineated a federal aid secondary system for Los Angeles County and requested that the county review and comment on the proposed system. The county, in the main, concurred and with minor changes recommended the approval of the federal aid secondary system for the County of Los Angeles as it now exists.

This system was envisioned by the Board of Supervisors and the Road Commissioner of the County of Los Angeles as a series of feeder routes which would be an integrated part of the county, state, and federal road network. The main F. A. S. routes in the county are shown on the accompanying map. It should be noticed that these routes invariably connect major county or state highways and are predominately located in the southeast section of the county. At the time these routes were delineated, the Division of Highways and the county anticipated rapid industrial and residential growth in the rural, unincorporated, and corporate areas of this section of the county. The actual growth of this area in the last few years not only reflects merit upon the foresight shown by the agencies which planned these routes, but demonstrates clearly the advantages of the State Division of Highway's attitude of local self-determination.

For key to locations of bridges illustrated in this article, see map on pages 2 and 3.

Are Feeder Roads

The secondary highway system as feeder roads in the County of Los Angeles are to a large extent the traffic arteries through which the economic life of the area is maintained. Metropolitan Los Angeles is the economic heart of the county and the surrounding communities and cities are dependent to a large extent for their economic existence upon the manufacturing and industrial potential, labor supply, and shipping and commercial facilities of metropolitan Los Angeles.

Unlike many areas of the United States which have highly centralized and concentrated industrial and residential areas, the County of Los Angeles and its corporate cities are noted for their decentralization. This decentralization together with the lack of adequate public transportation results in a greater dependence and usage of the county road network.

Bridge Problems

From 1940 to 1950, the County of Los Angeles had a population increase of 49 percent and an increase of 33.6 percent in registered vehicles which included a 135.9 percent increase in registered trucks. The above increase in population and vehicle density combined with the restrictive maintenance and construction features of the depression and World War II years to confront the road department with numerous bridges which had either an inadequate roadway width or had deteriorated, through age and the enforced lack of maintenance to such an extent as to cause a serious hazard to the public. These bridges presented a particularly acute problem on the federal aid secondary system where the traffic volumes show an enormous increase.

The road department with the concurrence of the board of supervisors decided initially to expend the federal aid and county highway aid funds on progressively replacing these load limited or bottleneck bridges. *Chart 1* lists the projects by their construction sequence while the accompanying map delineates their location. The source of funds, description, limits of the individual projects, and estimated 24-hour traffic count is also included.

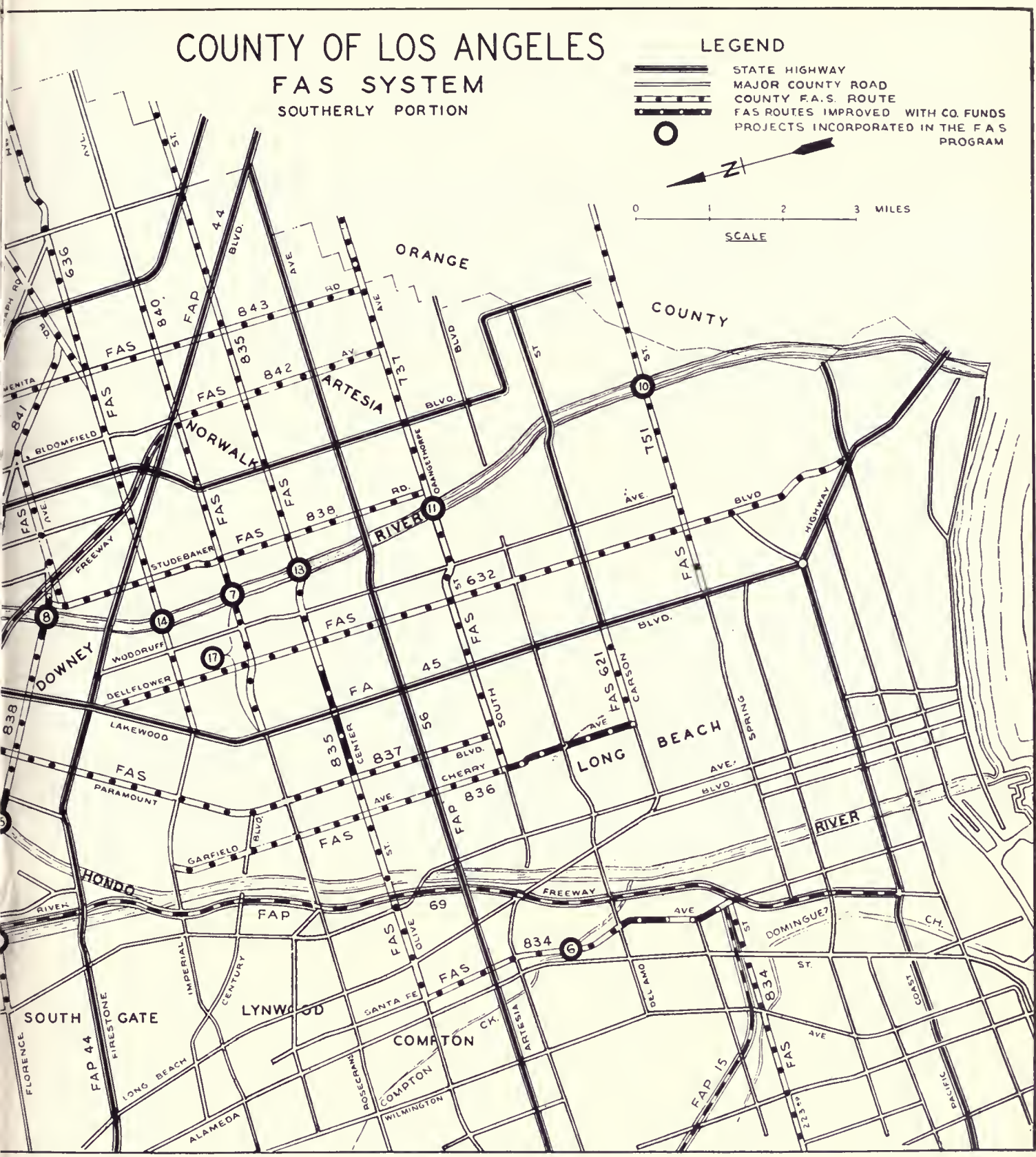
Four Other Projects

At this time four additional projects are proposed for the current federal aid secondary program. Two of these are road improvement and construction projects.



They are:

1. The resurfacing of existing pavement together with the construction of new pavement to provide a four-lane highway with eight-foot shoulders on Rosecrans Avenue from Lakewood Boulevard to 1,500 feet east of Woodruff Avenue.
2. The resurfacing of existing pavement and the construction of new pavement to provide a four-lane highway on Valley Boulevard from Puente



Avenue to 1,000 feet west of Hacienda Boulevard.

The other two are bridge and approach projects which include:

1. The construction of a four-lane reinforced concrete girder bridge on Washington Boulevard over the San Gabriel River and the Southern Pacific Railroad together with the necessary approaches.
2. The construction of a four-lane highway on Slauson Avenue from Rose-



UPPER: Bridge 2—Bridge over Santa Clara River and Southern Pacific tracks on Soledad Canyon Road (F. A. S. Route 830). Single column bents used to reduce stream obstruction. LOWER: Bridge 4—Bridge over Santa Fe Dam outlet works on Arrow Highway (F. A. S. Route 849).

mead Boulevard to Montebello city limits which includes a reinforced concrete bridge across the Rio Hondo.

Total Value $5,300,000

These 19 projects will have an estimated total completed cost of over $5,300,000 of which approximately $2,650,000 will be federal aid funds; $1,200,000 County Highway Aid Act funds; and $1,450,000 county funds.

State Helps Out

All of the projects with the exception of Soledad Canyon Road over the Santa Clara River and the Southern Pacific Railroad, which was designed by the State Division of Highways, were or will be designed by the County of Los Angeles. All bridge projects were designed for H20-S16-44 loading under the design specifications of the American Association of State Highway Officials. The tracings of the plans, a preliminary report, and suggested special provisions were furnished the State Division of Highways by the County of Los Angeles for all projects. The projects were reviewed, approved and prepared for advertising by the Division of Highways, which administers the federal aid secondary funds. The Division of Highways advertised and with the concurrence of the county, awarded the contracts for the individual projects.

Construction inspection and engineering were performed by the County of Los Angeles. In all cases the rights of way, design and construction engineering costs were financed by the County of Los Angeles from funds other than federal aid secondary. This

FEDERAL AID SECONDARY PROJECTS SINCE 1945

CHART I

Project, limits, and description	24-hr. traffic count	Total funds	Federal funds	County Highway Aid Act funds	County funds
1. Florence Ave. over the Los Angeles River, F. A. S. 838 (1): The construction of a 4-lane, 452′ long, reinforced concrete girder bridge and east approach.	12,000	$394,889.74	$227,000	$167,889.74	----------
2. Soledad Canyon Road over Santa Clara River and S.P.R.R., F. A. S. 830 (1): The construction of a 2-lane, 349′ long, reinforced concrete deck plate girder bridge.	3,000	227,832.93	128,000	99,832.93	----------
3. San Gabriel Canyon Road East Fork over North Fork San Gabriel Canyon, F. A. S. 825 (2): The construction of a 2-lane, 650′ long, steel truss bridge with reinforced concrete deck.	3,200	371,881.83	210,000	161,881.83	----------
4. Arrow Highway over Santa Fe Dam Release Channel, F. A. S. 849 (1): The construction of a 4-lane, 203′ long, reinforced concrete girder bridge.	7,000	66,061.18	38,000	28,061.18	----------
5. Valley Blvd. over the San Gabriel River, F. A. S. 852 (2): The construction of a 2-lane, 943′ long, reinforced concrete deck plate girder bridge together with the reconstruction of an existing through plate girder bridge to a reinforced concrete deck plate girder bridge providing a divided 4-lane crossing of the San Gabriel River together with the necessary approaches.	18,000	578,998.28	330,000	248,998.28	----------
6. Santa Fe Avenue over Compton Creek, F. A. S. 834 (1): The construction of a divided 6-lane, 226′ long, reinforced concrete slab bridge.	10,000	187,170.65	108,000	79,170.65	----------
7. Rosecrans Avenue over the San Gabriel River, F. A. S. 840 (1): The construction of a 4-lane, 304′ long, reinforced concrete girder bridge.	12,600	208,196.09	120,000	88,196.09	----------
8. Florence Avenue over the San Gabriel River, F. A. S. 838 (2): The construction of a 4-lane, 301′ long, reinforced concrete girder bridge.	10,000	208,000.85	120,000	88,000.85	----------
9. Beverly Blvd. over the San Gabriel River, F. A. S. 845 (1): The construction of a 4-lane, 355′ long, reinforced concrete girder bridge together with a 4-lane, 35′ long, steel and timber interim approach span.	13,000	295,918.36	160,000	2,116.18	$133,802.18
10. Spring St. over the San Gabriel River, F. A. S. 751 (1): The construction of a 4-lane, 237′ long, reinforced concrete girder bridge.	7,000	203,310.00	110,610	92,700.00	----------
11. Orangethorpe Ave. over the San Gabriel River, F. A. S. 737 (3): The construction of a 4-lane, 304′ long, reinforced concrete girder bridge.	8,000	217,700.00	116,000	100,500.00	1,200.00
12. Beverly Blvd. over the Rio Hondo, F. A. S. 845 (2): The construction of a 4-lane, 142′ long, reinforced concrete girder bridge together with 399′ of 4-lane, steel and timber interim approaches.	13,100	400,000.00	215,000	----------	185,000.00
13. Center St. over the San Gabriel River, F. A. S. 835 (1): The construction of a 4-lane, 316′ long, reinforced concrete girder bridge.	8,000	231,700.00	125,000	----------	106,700.00
14. Imperial Hwy. over the San Gabriel River, F. A. S. 636 (2): The construction of a 4-lane, 304′ long, reinforced concrete girder bridge.	11,000	231,200.00	125,000	----------	106,200.00
15. Florence Ave. over the Rio Hondo, F. A. S. 838 (3): The construction of a 4-lane, 174′ long, reinforced concrete girder bridge together with 237′ of 4-lane steel and timber interim approaches.	17,300	291,500.00	73,317	71,725.27	146,457.73
*16. Washington Blvd. over the San Gabriel River and S.P.R.R., F. A. S. 635: The construction of a 4-lane, 309′ long, reinforced concrete girder bridge and a 4-lane, 24′ long, reinforced concrete rigid frame over the S.P.R.R. together with the necessary approaches.	20,000	455,000.00	130,000	----------	**325,000.00
*17. Rosecrans Ave. from Lakewood Blvd. to 1,500′ east of Woodruff Ave., F. A. S. 840: The construction and resurfacing of 1.8 miles to a 4-lane pavement with 8′ shoulders.	12,600	164,000.00	88,600	----------	75,400.00
*18. Valley Blvd. from Puente Ave. to 1,000′ west of Hacienda Blvd., F. A. S. 852: The construction and resurfacing of 2.1 miles to a 4-lane pavement.	18,000	130,000.00	70,200	----------	59,800.00
*19. Slauson Ave. from Rosemead Blvd. to Montebello City Limits, F. A. S. 844: The construction of 0.9 mile of 4-lane pavement with 7′8″ shoulders including a 4-lane, 495′ long, reinforced concrete girder bridge across the Rio Hondo.	14,000	520,000.00	188,880	----------	331,120.00
Totals		$5,383,359.91	$2,683,607	$1,229,073.00	$1,470,679.91

* Proposed projects in current F. A. S. program.
** Includes $214,500 for participation by Southern Pacific Railroad.

minimized the bookkeeping and records for the individual projects. Specialized inspection and testing was performed by the Division of Highways upon the county's request whenever its existing facilities were located to conveniently perform this service. These operations included the testing of paint and structural steel as well as the shop inspection of structural steel fabrication. The design and construction engineering were performed by the county in close cooperation with the Division of Highways.



Bridge 3—Bridge on San Gabriel Canyon Road (F. A. S. Route 825) over North Fork of San Gabriel River

County Spends Millions

This coordination and high degree of cooperation between the Division of Highways, the County of Los Angeles, and the Bureau of Public Roads in the planning, design, and construction of these 15 federal aid secondary projects have resulted in work of the highest caliber. These projects represent about 52 percent of the funds expended since 1945 on federal aid secondary routes within the County of Los Angeles. The actual road network deficiencies on the federal aid secondary system within the county have been so extensive that numerous additional projects were constructed entirely with county funds. The high degree with which the federal aid secondary program was integrated into the county-wide road network is clearly demonstrated by the fact that the county, without federal aid, financed and expended almost $6,000,000 on federal aid secondary routes or extensions of federal aid secondary routes for new construction since 1945. The above figure does not include funds expended for maintenance, street lighting, or traffic safety signal installations.

Chart II delineates these county projects together with the county projects proposed to be constructed by 1955. Included in *Chart II* are the limits of the projects, the construction cost or estimate, the federal aid secondary route, or federal aid secondary project which initiated the project or

Bridge 5—Faur-lane divided highway bridge over San Gabriel River an Valley Boulevard (F. A. S. Route 852)





Bridge 8—Bridge over San Gobriel River on Florence Avenue (F. A. S. Route 838)

improvement which the county project carries through.

Program Achieves Purpose

A comparison and examination of the map and *Charts I* and *II* clearly demonstrates that the federal aid secondary program in the County of Los Angeles has achieved its purpose. It is doing much toward furthering the program of developing and improving a definite system of secondary feeder roads within the county. This progress may be attributed to the fact that the federal aid secondary program requires a defined system of roads, sets minimum design and construction standards, and furnishes funds to assist in the

Bridge 13—Old norrow bridge over San Gobriel River on Center Street (F. A. S. Route 835) with new four-lane reinforced concrete bridge under construction on right



CHART II

COUNTY PROJECTS ON F. A. S. ROUTES

JOBS COMPLETED SINCE 1945

Name	F. A. S. route	Limits	Construction cost
Arrow Highway	849	Azusa Canyon Rd.—Irwindale Ave.	$36,382.35
Arrow Highway	849	Bridge over Little Dalton Wash	62,900.00
Arrow Highway	849	Bridge over Sawpit Wash	94,065.00
Arrow Highway	849	Longden Ave.—Azusa Canyon Rd.	165,961.63
**Camp Baldy Rd.	831	½ mi. E. of Padua Ave. to Camp Baldy	1,050,000.00
Center St.	835	Downey Ave.—Clark Ave.	83,754.60
Center St.	835	Paramount Blvd.—Downey Ave.	61,279.43
Cherry Ave.	836	South St.—Carson St.	186,329.89
Duarte Rd.	848	Bridge over Sawpit Wash	33,467.00
Florence Ave.	838 (1)	Los Angeles River Bridge approaches	92,421.46
Florence Ave.	838 (2)	San Gabriel River Bridge approaches	88,025.45
*Imperial Highway	636	Bridge over Los Angeles River	502,567.00
*Imperial Highway	636	Los Angeles River Bridge approaches	62,022.65
Live Oak Ave.	849	El Monte Ave.—Peck Rd.	75,603.76
Lower Azusa Rd.	850	At Peck Rd.	15,000.00
Orangethorpe Ave.	737	Bridge over Coyote Creek	179,753.30
Paramount Blvd.	837	Florence Ave.—Telegraph Rd.	73,567.94
Peck Rd.	857	At Lower Azusa Rd.	50,000.00
*Peck Rd.	857	Garvey Ave.—Durfee Ave.	163,972.46
*Rosecrans Ave.	840	Bridge over Los Angeles River	1,110,000.00
Rosecrans Ave.	840 (1)	San Gabriel River Bridge approaches	54,982.62
*Rosecrans Ave.	840	Temple St.—Atlantic Ave.	107,728.61
Slauson Ave.	844	Garfield Ave.—Telegraph Rd.	127,367.15
Slauson Ave.	844	Garfield Ave.—Los Angeles River	80,850.59
Santa Fe Ave.	834	Carson St.—U.P.R.R.	16,283.70
Santa Fe Ave.	834	Dominguez St.—Del Amo Blvd.	90,798.80
*Santa Fe Ave.	834	Independence Ave.—Laurel St.	61,889.50
Soledad Canyon Rd.	830	Bridge over Nelson Ranch cattle pass	34,144.48
**Soledad Canyon Rd.	830	Santa Clara River Bridge—Sierra Highway	800,000.00
Valley Blvd.	852	Garvey Blvd.—Puente Ave.	79,730.26
Valley Blvd.	852	Lemon Ave.—La Puenta Ave.	77,433.65
Valley Blvd.	852	Pomona Blvd.—Bellevue Ave.	112,181.06
*Washington Blvd.	635	Atlantic Ave.—City limits of Vernon	122,744.35
*Washington Blvd.	635	Atlantic Ave.—Eastern Ave.	9,136.14
*Washington Blvd.	635	U.P.R.R.—City limits of Vernon	29,079.85
		Total	$5,991,424.68

* Extension of F. A. S. route.
** Under construction.

PROJECTS PROPOSED FOR CONSTRUCTION BY 1955

Name	F. A. S. route	Limits	Construction cost
Arrow Highway	849	Irwindale Ave.—Azusa Ave.	$211,000.00
Beverly Blvd.	845 (1)	Rosemead Blvd.—U.P.R.R.	350,000.00
Beverly Blvd.	845 (2)	Rosemead Blvd.—Bluff Rd.	350,000.00
Center St.	835 (1)	San Gabriel River Bridge approaches	170,000.00
Florence Ave.	838 (3)	Rio Hondo Bridge approaches	135,000.00
Florence Ave.	838	Eastern Ave.—Emil Ave.	170,000.00
Imperial Highway	636	Lakewood Blvd.—Downey Ave.	72,000.00
Imperial Highway	636 (2)	San Gabriel River Bridge approaches	174,000.00
Orangethorpe Ave.	737	Coyote Creek Bridge approaches	10,000.00
Orangethorpe Ave.	737	Palo Verde Ave.—Studebaker Rd.	100,000.00
Orangethorpe Ave.	737 (3)	San Gabriel River Bridge approaches	65,000.00
Rosecrans Ave.	840	Lakewood Blvd.—Garfield Ave.	125,000.00
Rosecrans Ave.	840	Los Angeles River Bridge approaches	175,000.00
Santa Fe Ave.	834	Artesia Ave.—Del Amo Blvd.	330,000.00
Slauson Ave.	844	San Gabriel River Bridge and approaches	350,000.00
Spring St.	751 (1)	San Gabriel River Bridge approaches	90,000.00
Valley Blvd.	852	Baja Ave.—Lemon Ave.	55,000.00
Valley Blvd.	852	Baja Ave.—Hacienda Blvd.	210,000.00
Valley Blvd.	852	Thru Puente	10,000.00
		Total	$3,152,000.00

construction of definite authorized projects. Of the more than 4,500 miles of county roads and highways, only about 310 miles or about 7 percent is incorporated in the federal aid secondary system.

On this 7 percent of county highways, there has been expended for new construction since 1945, approximately $2,200,000 federal funds; $1,200,000 state funds; and $4,500,000 county funds. The county further proposes to expend for new construction during the next three years on F. A. S. routes and extensions of F. A. S. routes $3,000,000 county funds in addition to any federal aid secondary funds which may become available during that period. The expenditure of these contemplated funds will materially improve the federal aid secondary system within the county. However, even this large expenditure will not bring up to required standards the entire F. A. S. system. Many times the amount expended and many times the amount proposed to be expended could be efficiently used in improving and developing this system of essential and highly traveled feeder roads.

In Memoriam

MICHAEL N. DOBROTIN

Michael N. Dobrotin, a member of the office staff of District VII, Division of Highways, for over 12 years, died on November 3, 1951, at the Queen of the Angels Hospital in Los Angeles, after a long illness.

Mike, as he was known to all his friends, was a very soft-spoken, quiet individual, whose personal history reads like an adventure story. Born in Danilov, Russia, in 1896, he was educated in Yaroslavl grade and high schools and at the Karkov Institute of Forestry. This was in 1916, and after a year in a military school, he became a lieutenant in the tsar's artillery. After the fall of the Kerensky regime Mike retreated with the "White" forces into Siberia. For about a year he worked as a forester at Perm, but finally was forced to flee Russia and went to Harbin in Manchuria. Here he was employed by the Chinese Eastern Railroad as an engineering draftsman. By 1925 he had made his way via China proper to the United States.

Before coming to the Division of Highways Mike worked for the Yuba Dredge Manufacturing Co., the Southern Pacific Railroad, the University of California, and the U. S. Forest Service. He took time out from work to secure a B.S. degree from California in 1933. All of his state service was with District VII.

He is survived by his widow, Katherine, and two sons, Mischa, an engineering student at the University of Southern California, and Boris, studying agriculture at California Polytechnic College at San Luis Obispo.

Wanton Damage

Overloaded Logging Trucks Destroying Northern Highways

By F. WALTER SANDELIN, Member, California Highway Commission

ANY PERSON who will take the trouble to investigate, will find that a district engineer for the Division of Highways does not live a life of ease and contentment.

Practically every one of our district engineers is a combination of Solomon for his wisdom and a practical person for his ability to keep everybody in his district seemingly satisfied. He has one standard excuse when somebody asks him why he doesn't do a certain job. His answer is that the Highway Commission won't vote the money for the job.

To find out just what was going on in District I, it was my pleasure, not so long ago, to take a two-and-a-half-day trip with A. M. "Pete" Nash, our district engineer whose headquarters are in Eureka. After meeting Nash my dunnage was transferred to his car and we were off for Crescent City.

Heavy Logging Traffic

One of the phases of our highway work is the building of roads that will stand up under legal loads. In traveling to Crescent City from Eureka one is immediately struck with the idea "where are all the logs going?" Truckers are hauling logs in both directions. So I had to ask "Pete" the big question of "Why?"

Nash tells me that there are so many mills in his section of California and so many loggers cutting timber that it seems no one has a short haul. All the hauls would seem to be some place else but where the timber is cut. Later on I was to find out more about this.

The next morning we started out on U. S. 199. This is the highway between Crescent City, Cal., and Grants Pass, Ore. It's a fine road and one upon which plenty of scenic beauty abounds.

Huge Slide

About one mile south of Idlewild we came upon the location of a "big slide" which came into the highway last winter. Here about 30,000 cubic yards of dirt and rock slid down the hillside and covered the highway. It took three weeks to remove the slide, but that did not put the road back in

The driver of this overloaded truck is hiding out off the highway awaiting a time when an officer of the California Highway Patrol and the weigher at the Division of Highways scales depart



condition. From the Contingency Fund the money was voted by the Highway Commission to repave this particular section. The contract was advertised for bids the last of May and the job should be done sometime this summer.

Just beyond the slide we turned around and retraced our tracks to Crescent City and continued south on U. S. 101. While driving along we noticed, and passed, several unusually large loads of logs and several loads of lumber. The State has recently completed a new pit scale adjacent to the highway at Dows Prairie, to provide the Highway Patrol with a better means of intercepting overlegal loads, and it was our good fortune to see the initial use of this scale for the purpose intended.

Scales in Operation

When we pulled up at the scale we found that the Sealer of Weights and Measures was there and had just checked the scale and declared that it was perfect and could be put into operation. The sergeant of the California Highway Patrol in charge of commercial enforcement in this territory and an officer were also there, as was the resident engineer who supervised the construction of the scales. Nash informed them of the large loads we had passed, so the sergeant and his assistant declared the scales open for business. Of the first three truckloads weighed, two were 'way overweight. The sergeant immediately gave the drivers tickets.

Just to show you how close those fellows can load, when they want to, I copied several results of the weighing operations. One truck and trailer which legally can carry 76,000 pounds, weighed in at 76,880 pounds. The law is so written that a truck has a leeway of 1,000 pounds over specified weight. Another truck weighed 76,940 pounds. And a truck whose limit is supposed to be 72,000, weighed in at 72,900 pounds.

No wonder our highways are going to pieces in Del Norte, Humboldt and Mendocino Counties.

Overloads Do Great Damage

While damage from overloads on the Redwood Highway has its serious aspects, the effects of these heavy loads on the bridges and traveled way of the "feeder" highways in the northwestern part of the State is even more devastating. The crossroads, as I call them, were not built for the vast amount of heavy trucking that they are now carrying. Originally, the main purpose of these roads was for recreational service and to serve the few people who settled in the mountains.

In the old days of logging, the loggers built railroads to get their logs to market. But with the development of the present-day modern heavy-duty truck, during the past few years all logging is now done with these vehicles. The loads are now being carried on our highways and many of our highways in the timber areas are being broken down due to the greediness of those contract log haulers who have no respect or consideration for legal weight limits.

Log Haulers Selfish

The contract log haulers get paid for the total board feet of timber they carry, and too many of them don't seem to care whether we have highways in California or not. Just as long as they get their logs out to the mill and get paid for the job they seem satisfied.

There are some operations where the men running them know that our highways are not capable of standing up under such abuse and they have ordered their truckers to stay within the law regarding their loads. But this kind of operators are few and far between.

After weighing some dozen or so loads we noticed that there were no more coming down the highway. Knowing that the word had been passed by the northbound trucks, we knew it was no use staying there unless we wanted to stay all night. As soon as a trucker signals a scale open and working, all overloads headed that way pull off to the side of the road and lie "doggo" until they get the signal that all is clear. The only way to catch all of the "overloaders" is to have sufficient crews on the job so that the scales can be manned around the clock.

Big Gold Haul

After leaving the scales we headed south as we were going to go over U. S. 299. This is the highway that goes east a few miles north of Arcata and leads across the mountains to Redding. We have just installed a new scale on this road, but it was not open for service so we did not stop there.

You know many of our highways have historically interesting stories connected with them. Nash showed me the evidence of an old tunnel at Big French Creek, where the Trinity River makes a big bend. The story is that many years ago four men dug this tunnel across the bend and then damned the river during the low water season. The water was diverted through the tunnel and it is related the four men took $400,000 in gold from the bed of the river in a matter of a month.

Logging Poses Problems

The logging industry is very busy on this road, as they are on all roads in our northern counties. The way some of them are logging cannot help but pose serious problems for the future, not only to the Division of Highways, but to others as well.

Before the loggers cut all the trees, rain had a chance to soak into the ground. But with the denuding of the hills of all forest growth, mountain rain water is going to run off the hillsides and cause erosion as well as a lot of high water in all the streams, in the future. This will, no doubt, react to the detriment of our highways in more ways than one.

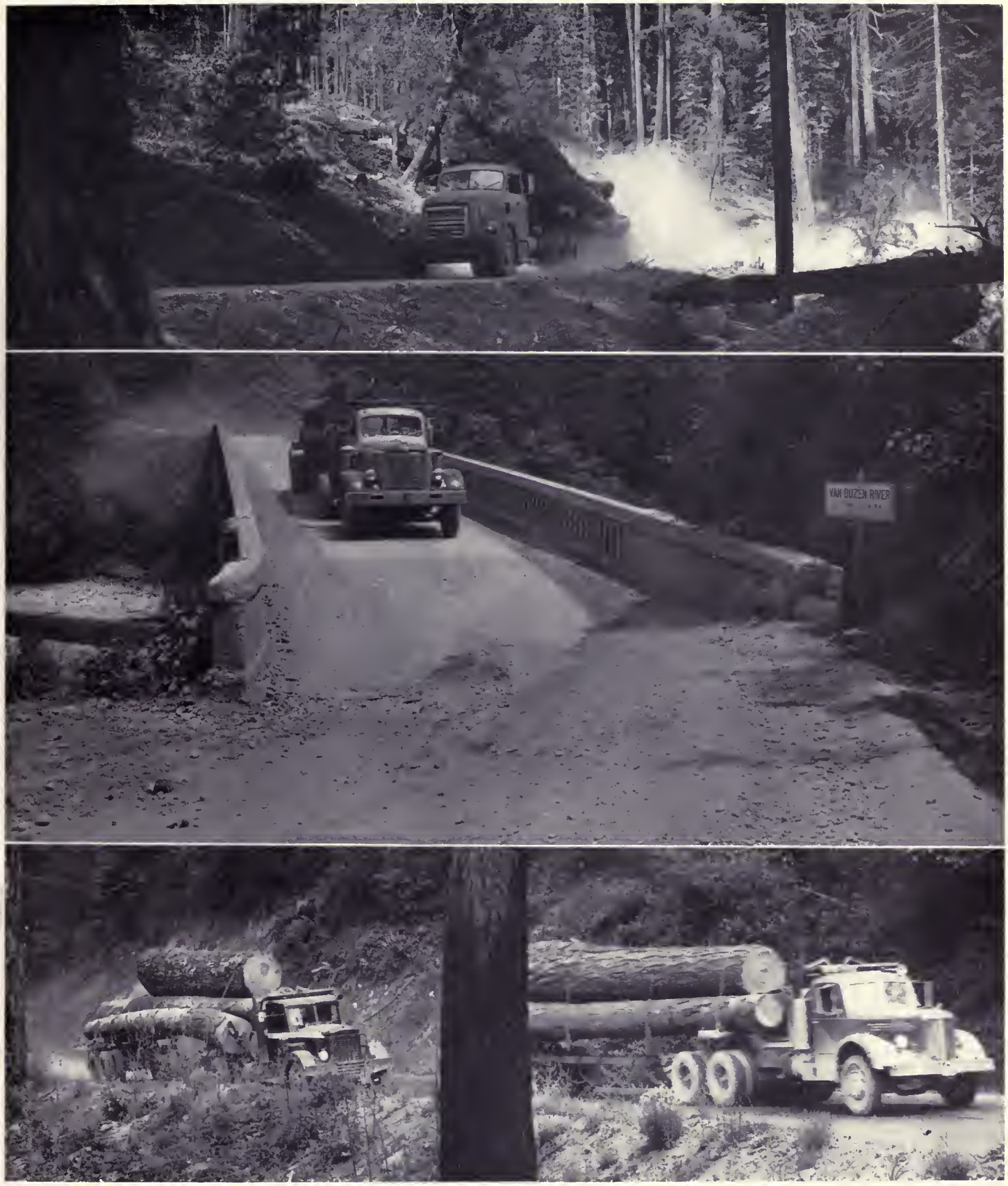
Tuesday evening we spent at our Convict Camp No. 36 at Burnt Ranch. Dinner and breakfast were both good meals and the guest cabin is well arranged and has comfortable beds.

On to Weaverville

Wednesday morning we were up bright and early and on our way to Weaverville. Here we turned south through Douglas City, Hayfork and Peanut; then west over a state highway known as State Route 35. Portions of this road from Bridgeville west have caused much controversy, not only in that neighborhood but all over District 1.

The State Forestry Department and the United States Government have stated that one of the greatest stands of uncut timber is tributary to this road. Many timber operators have started operations in the areas contiguous to this highway during the last

. . . Continued on page 18



UPPER—Heavily loaded lumber truck kicks up dust on Sign Route 36 in Humboldt County. CENTER—Van Duzen River Bridge damaged by logging trucks. LOWER—Logging trucks on U. S. 299.

Gyroscopic Equipment For Alignment, Grade Surveys

By JAMES T. McWILLIAM, Assistant Highway Engineer

A GOOD DEAL of experimentation and research has been carried on by the California Highway Planning Survey section of the Department of Public Works in conjunction with the Sperry Gyroscope Company of San Francisco with the purpose of developing an instrument and technique that would measure and calculate data concerning alignment and grades on existing roads accurately and rapidly.

The need for such an instrument was occasioned by a request in 1947 by the Bureau of Public Roads that the department cooperate in testing a sight distance and curvature manual proposed by them. This manual among other things proposed that curve radii and degree of central angle data be furnished. The manual also proposed that data be collected to show length and percent of grade for the various grades.

Such an instrument and an operational technique have been devised that seems to have some promise in the field of rapid surveying.

The Gyro Car

The instrument is in brief a station wagon *(See Appendix D)* equipped with an *odometer*, reading to the thousandth mile and two *gyroscopes*, one horizontally and one vertically installed that make possible the measurement of azimuths to the nearest degree and the measurement of grades and superelevations to the nearest percent.

The *odometer* works from a junction off the regular speedometer connection and has the desirable qualities of a reset, preset and a backup registering dial. It was devised and installed by the firm of Roy DeMartini Speedometer Sales and Service Company of Sacramento.

The *horizontal gyroscope* or the "Gyrosyn" as it is termed in the trade, is so devised that it indicates azimuth to the nearest degree. It has a declination adjustment so that for a given locality it can be set to register true azimuths. A "flux valve" mechanism keeps it from precessing from the true reading by causing magnetic lines of force to be applied against the proper gimbal of the gyro thereby continually "slaving" or bringing the gyro axis back to its relationship to the earth's magnetic field.

Since the preparation of the accompanying report on the development of gyroscopic equipment and its use in making rapid surveys, the Division of Highways "gyro car" has been in almost constant operation throughout the State.

More than 3,000 miles of state highway have been surveyed by means of this equipment in a period of a few months, and surveys of another 5,500 miles are under way or scheduled. The grade and alignment data thus rapidly obtained are being made available to the Automotive Safety Foundation for inclusion in the study of California highway deficiencies which the foundation is making for the California Legislature.

Verticol Gyroscope

The *vertical gyroscope* is an adaptation of that used in the automatic landing control mechanism of aircraft, more particularly described as the "A-12 Precision Gyropilot." The phenomenon of precession in this gyro is controlled by two level bubbles mounted parallel to each of the two gimbals of the gyro. Through a system of induced voltages, current is caused to be circuited through two finely adjusted voltmeters when the car body deviates from the horizontal plane. The amount of the deviation is measured in percent of grade and superelevation.

These two gyroscopes were installed by the Sperry Gyroscope Company of San Francisco, under the supervision of the Aeronautical Service Department of that company headed by Norman Thompson.

Combination of Three Instruments

A combination of these three instruments, the *odometer*, the *gyrosyn*, and the *vertical gyroscope* make possible the measurement of:

1. Distances to the nearest 1/1000 mile,
2. Azimuths to the nearest degree, and
3. Grades and superelevations to the nearest percent.

Supplementary installations in the vehicle consist of:

1. A 110-volt 750-watt generator to furnish the electrical current necessary to run the gyros,
2. A converter to change the cycle of the electric current from 60 to 400,
3. A voltage regulator to guarantee a steady flow of current to the registering dials,
4. Two inclinometer tubes to make initial settings of the vertical gyro and to make possible quick intermediate checks at frequent stops, and
5. An aiming device installed on the front bumper to aid in setting the car in the correct position for an azimuth or generalized grade reading.

Recordings Taken

In the operation of the vehicle, recordings are taken that indicate:

1. The odometer location of the beginnings and endings of all curves and tangent sections,
2. The azimuth reading of each tangent and at points of compounding or reversing of curves,
3. The superelevation of each curve encountered,
4. The odometer location of the estimated points of intersection of extended grades,
5. The percent of grade between those points, and
6. Such notes as may be judged necessary for the use of the draftsman in delineating the final line traversed.

These notes are given to the Planning Survey's IBM Section where they are processed mechanically and

tabulations made that show in addition to the recorded data the following:

1. Azimuth of the chord of the curve in degrees and half degrees.
2. Central angle of curves in degrees.
3. Intervening distances, i.e., lengths of tangents or curves in 1/1000 miles.
4. Lengths of chords of curves in 1/1000 miles.
5. Radii of curves in feet.
6. Safe driving speeds on curves in miles per hour.
7. Progressive departures or X coordinate values (eastings or westings) in 1/1000 miles.
8. Progressive latitudes or Y coordinate values (northings or southings) in 1/1000 miles.
9. Grade profile or elevations in tenths of feet.

The data above are then plotted on 10 x 10 cross-section paper at a scale of usually 10 inches equals one mile and the result is a plan and profile of the traversed road limited only to the degree of accuracy the fundamental instruments are designed to give.

What Experience Shows

Experience gained in the operation of this vehicle over about 3,000 miles of roads indicates that:

1. Accuracies of 0.2 percent can be reliably expected in the odometer distances taken.
2. Accuracies of from 0.5 percent to 0.9 percent may be reliably expected on the closure of traverses calculated. (By the application of a factor in the IBM processes the error of closure can be eliminated.)
3. Grades can be reliably estimated to within one-half of 1 percent.
4. The field operation phase can be done at a rate of about five miles per hour.
5. The combined costs of operating the equipment in the field and of processing the field notes mechanically are well under $10 per mile of road traversed.
6. The time taken to plot the IBM tabulations and to trace to a reproducible copy, varies a good deal depending on the topography. Early figures indicate that a mile can be plotted and tracings made in about three hours.

Accuracy of Results

The accuracy of the results of the gyro traverse, which is the name given this technique, indicates that it compares favorably with the accuracies that might be expected of the more formal method of stadia traverse. An experimental project comprising 406 miles of gyro traversing conducted in San Bernardino County showed that data could be taken in the field, delivered to the IBM Section for processing and a usable plot prepared within a period of four days. In regard to the IBM processing, the larger the project the greater the speed that can be attained on a per mile basis as this processing lends itself to handling of mass data.



Figure 1 GYROSCOPIC EQUIPMENT IN TRAVELING POSITION

Uses of this technique have so far been confined to the preparation of a plan and profile plot of such state highways that have never been formally surveyed; to the establishing of a key net of roads within a county which forms the basic net in road inventory procedures; and to furnish quick statistical data concerning alignment and grades on certain routes that can be obtained at much less expense and time than that required to review the existing plans.

The equipment has just recently concluded a project that required traversing the greater part of the rural highways in the State. This project encompassed the collecting of basic alignment and grade data on about 10,000 miles of highways which are to be used in determining horizontal and vertical restrictions due to the alignment and grade characteristics of the road.

It is anticipated that new uses will develop as the existence of the vehicle and the technique is made known on a broader basis. Up to the present, its operation has been confined to the Planning Survey section necessarily in order to establish an operational procedure, to test its accuracy and determine basic costs, and, all in all, to determine the practicality of the instrument and its attendent technique.

Description of Basic Instruments

A. THE ODOMETER

The odometer designed for and installed in the gyroscopic equipment vehicle *(See Appendix D)* is merely a revolution counter turned by a cable off a junction with the regular speedometer cable. It is geared so that it registers each time the car goes through 5.28 feet or one-thousandth mile of distance. It has a five digit registering dial hence it can register a distance up to 99.999 miles. It can be manually set to any predetermined figure as well as

reset to zero. It also is reversing, that is, it will subtract when the car is backed up. This is useful for cases occur where a mileagle reading is left out or a position is overrun and when discovered merely backing up will establish it.

Tests made in regard to tire pressure, operating temperature and tire slippage indicate that accuracies of horizontal distance could be kept around two-tenths of 1 percent. Greater accuracies could be achieved in all likelihood by using a fifth wheel where these factors would be minimized. The inconvenience of attending such a device was considered to outweigh the advantages of the additional accuracy likely to be attained.

The odometer used was designed and installed by the Roy DeMartini Speedometer Sales and Service Company of Sacramento, and it has developed no problems of maintenance in its operation to date.

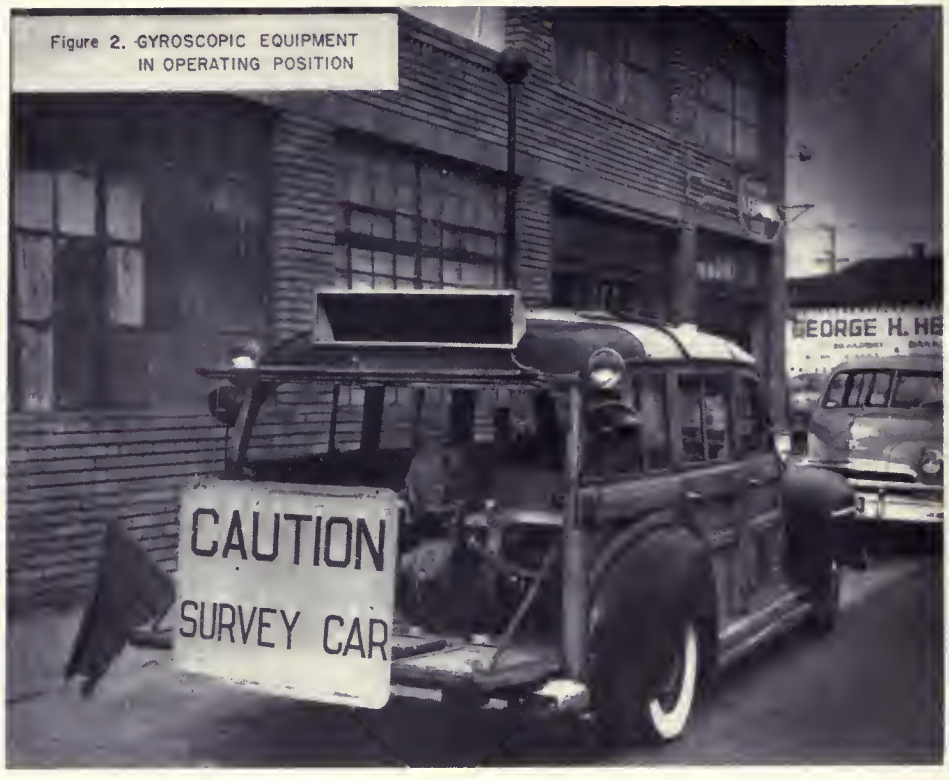


Figure 2. GYROSCOPIC EQUIPMENT IN OPERATING POSITION

B. GYROSYN OR HORIZONTAL GYROSCOPE

The horizontal gyroscope or "Gyrosyn" is the instrument that has been selected for measuring azimuth, that is indicating the direction of travel. *(See Appendix D.)* It operates on 115 volts, 400-cycle A.C., 3-phase current and 28 volts of D.C. It takes 28 watts of A.C. and 20 watts of D.C. Its rotor spins at near 24,000 r.p.m. A perfect gyroscope—that is one where all friction is reduced to zero and perfect balance is achieved—will maintain its axis of rotation fixed in relation to its position in space. This frictionless and perfectly balanced gyro obviously is not possible of attainment. Friction and unbalance ever so little as it might be causes a gyroscope to precess, that is, move its axis to counteract those forces.

This leads to the necessity of applying certain controls on the instrument in order to cause its axis to remain fixed. The earth's magnetic field furnishes a very handy reference to use for this purpose. It is relatively static and bears a constant relationship to true north within the area of any project we are likely to devise.

The Flux Valve

Just how the gyro rotor axis is caused to keep its alignment fixed in relation to the earth's magnetic field is understandable generally only to those with a more than ordinary knowledge of electricity so its detail will be covered but sketchily here. The *flux valve* or the ball that is mounted about three feet above the top of the vehicle contains the instrument that accomplishes this. *(See Appendix D.)* It senses the earth's magnetic field and transmits it to a signal selsyn in the gyro housing, that in turn, electrically causes a force to be applied to the proper gimbal forcing the axis of the rotor to align itself with the magnetic field.

When the axis is correctly oriented that fact is made known by what is called an annunciator that shows in the upper right corner of the face of the Gyrosyn. This annunciator alternates from a dot to a plus sign when the axis is aligned, indicating that forces are being applied on both sides of the gimbal alternately and in the same relative amount. This annunciator has a dual purpose—it not only indicates that gyro axis is aligned properly (by its alternating dot and plus) but it also indicates whether a field is being encountered where the magnetic lines of the earth are disrupted or abnormal. Such an abnormality will cause either the dot or the plus sign to appear constantly, according to which way the new magnetic lines are causing the axis to be moving. When this situation exists or when it is feared that it might happen, the influence of the flux valve is cut off by means of a switch and when the disturbance is over, the flux valve influence is cut back in and a check is made that the signal alternates before making further azimuth readings.

Frictian and Unbalance

While running with the control cut off the gyro will precess at a rate proportional to its friction and unbalance. However, this rate is reduced by proper maintenance to be less than roughly one-half degree in five minutes. This causes little concern for the areas of abnormal influences of the earth's magnetic lines are not large and are passed through rather quickly.

C. THE VERTICAL GYROSCOPE

The installation and operation of the Vertical Gyroscope posed greater problems than did that of the Horizontal Gyroscope. *(See Appendix D.)* For one thing, it was desired that the grade and superelevation be recorded

in percent. This is equivalent to reading an angle of less than half a degree (45°=100 percent). The gyro axis is but some three inches long, and half degree of movement means about 0.01 inch in actual displacement.

Just as previously explained, a perfect gyro is not possible of attainment. Friction, and unbalance forces, tend to move its axis of rotation. We must apply controls on the vertical gyro to keep its axis plumb, or it is the deviation of the plane normal to the plumb that gives the grade and super readings.

Mounted on the top of the gyro axis gimbals are *two level bubbles*, one on the long axis of the car and the other at right angles to it. These bubbles are bridged with an electric current, that is, an electric terminal is drawn out of each end and another terminal is drawn from the middle. The liquid in the level tube is a conductor of electricity and as long as the bubble remains center an equal amount of current flows from the center terminal to either of the end terminals. However, when the bubble is displaced—one side or the other—more current flows through the terminal away from the bubble. This causes a force to be applied to the proper gimbal to erect the axis and bring it back to the vertical. There is no way of detecting whether the vertical reference is truly vertical or not. This gyro is housed in a metal case and the operation of it cannot be observed. And, if it could be observed, it is not likely that one could detect what would be an appreciable error in this vertical reference.

Bubbles on Gyro Gimbal

Conceivably, if the two bubbles explained were depended upon solely to keep the gyro axis plumb then situations of acceleration and deceleration, or turning curves with the incident lateral forces would cause disturbances that would tend to force the vertical axis out of plumb. To take care of these conditions another set of bubbles parallel to the two mentioned are placed on the same gyro gimbal. These bubbles when molested by acceleration or deceleration or lateral turning forces cause a relay to be tripped which cuts out the effect of the primary control bubbles and the gyro runs free for the period during which that situation exists. And, as before when running free, the gyro precesses according to friction and unbalance forces. The conditions that cause these disturbances exist for periods of very short duration when it is realized that the rate of travel is around 5 to 10 miles per hour.

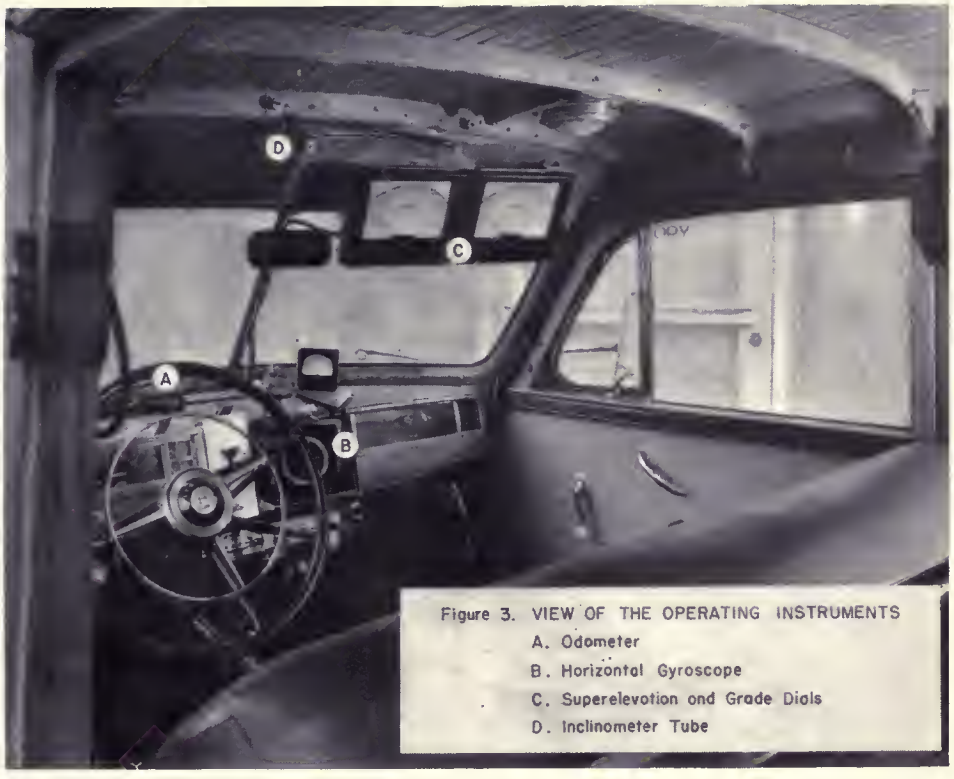


Figure 3. VIEW OF THE OPERATING INSTRUMENTS
A. Odometer
B. Horizontal Gyroscope
C. Superelevation and Grade Dials
D. Inclinometer Tube

It is necessary to take all the *spring action* out of the vehicle to get true grade and super readings. If this were not done, variations of loading would change the car body with respect to the axles and readings of grade and superelevation would be appreciably in error.

When the spring action is taken out of the car the vibration is necessarily increased, making it harder to take notes and limiting the roads over which the vehicle can be operated.

FIELD OPERATION

Two men operate the equipment in the field. The party chief acts as driver and selects all the points at which observations are to be made. At these points he reads the various instruments and the assistant records all the data on a form (*Appendix A*) especially designed so that subsequent IBM procedures are facilitated. The manner in which this field work is accomplished is roughly as follows:

The general information such as road description, date, personnel, time, etc., are recorded in the "notes" section of the form; the odometer is set to zero and movement is started forward. As each change of alignment detail is encountered, the odometer position of that change, the identifying code describing the change, and the azimuth of the new direction is recorded in the proper column of the form. In regard to curves the odometer position of their beginning and the proper code that is CR or CL indicating a right curve or a left curve and an entry in the superelevation column is made.

In respect to grades, the odometer position of the estimated intersection of the grades extended is recorded, but the actual grade is not read for that position until the maximum or minimum grade is reached. This gives information needed to roughly calculate the elevation at any point along the route. It has been found difficult to identify beginnings and endings of vertical curves and there is no quick way of calculating the elevation of points on them.

In order to properly orient the traverses the position of every available *triangulation station* encountered is noted. In fact, special traverses are run to such positions if they are not too far out of the way. Triangulation stations are known geodetic positions established by precise survey methods. Locations of and data from all *bench marks* are also recorded. These serve to give an idea of the accuracy of the work done in the vertical sense.

THE IBM PHASE OF THE GYRO SURVEY OPERATION

In order to make the gyro type survey a practical procedure, it is necessary to devise a mass mechanical method of calculating the field notes of the traverses. When it is considered that 680 miles of traverses taken in Humboldt County meant the taking of 24,000± observations, their calculation by ordinary methods would take quite a time. A short cut method has been devised such that roughly within a week a tabulation showing certain data can be produced. This tabulation includes a great deal of information, most of which is mechanically calculated from the notes as shown on the field sheet form of *Appendix A*. For instance, machine processes give the—

1. Azimuth of the chord,
2. Central angle of curve,
3. Intervening distance,
4. Length of chord of curve,
5. Radius of curve,
6. Safe driving speed on curves,
7. Departures or X values,
8. Latitudes or Y values and,
9. Elevations in feet.

—all from the field note detail. *Appendix B* shows the form upon which this is printed.

Without going into too much technical detail of just how these calculations are done on the machines, a brief review of each one is outlined.

1. THE AZIMUTH OF THE CHORD

The azimuth of the chord is gotten by adding to that azimuth at the beginning of a curve, the azimuth upon leaving, and then dividing by two.

There are certain complications that enter into the picture when the entering azimuth and the leaving azimuth are on opposite sides of zero or 360 degrees. These complications are not great and it is only necessary to add 360 degrees to the azimuths and then divide by two. Cases where the angular turn is greater than 180 degrees are relatively few and are handled manually.



Figure 4 VERTICAL GYROSCOPE INSTALLATION

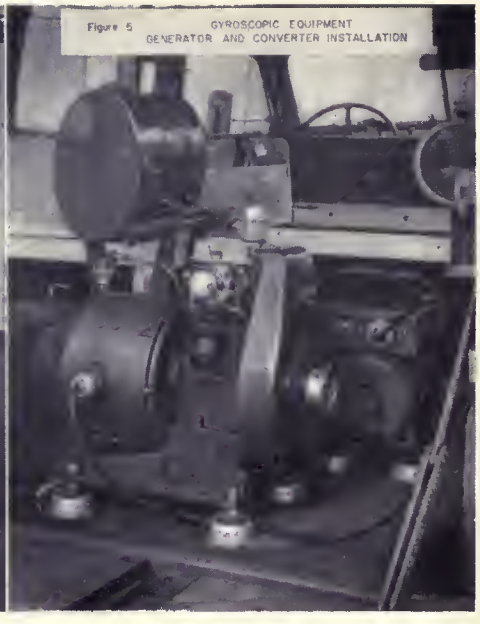


Figure 5 GYROSCOPIC EQUIPMENT GENERATOR AND CONVERTER INSTALLATION

2. CENTRAL ANGLE OF CURVE

The central angle of the curve is gotten merely by subtracting the two azimuths, the entering azimuth and the leaving azimuth. Again special consideration must be made for the central angle that embraces the transition from 360 degrees to zero degrees.

3. INTERVENING DISTANCE

Intervening distance is gotten by subtracting the beginning odometer

CALIFORNIA STATEWIDE HIGHWAY PLANNING SURVEY
GRADE AND ALIGNMENT SURVEY

CHPS RA 111 SHEET 1 OF 8

ROAD DESCRIPTION Hum 1 K | CHIEF McW | RECORDER R.J.M. | TIME OF BEGINNING 1300 | DATE 23 May 51

NOTES	SEQUENCE CODE	BEGINNING ODOMETER	ENDING ODOMETER	GRADE	ALIGN CODE	AZIMUTH	CENTRAL ANGLE	SUPER ELEVATION
TRAVERSE NO 34	1							
NORTH ON HUM 1 K	2							
TIME 1300 23 MAY 51	3							
McW MARTIN	4							
COOL CLOUDY	5							
ALIGNMENT TRUE	6							
BEGIN SEC HUM 1 K	7							
AT ODOMETER 19983	8							
OF TRAVERSE NO 33	9	00.000			LL	96		
		.000		0	CL			6L
		.060			T	89		
ORICK		.618		-1				
HWY MTCE STA ON RT		.640						
		.665			CL			6L
		.790			T	40		
		.885			CL			2L
		.925		+2				
BR 4 28 REDWOOD CR	1	.992						
USCGS BM J74	2							
ELEV 33 FT	3							
BEGIN TRUSS		1.024			T	05		
END TRUSS		1.070						
		1.075		-6	CR			3R
END BR		1.115						
		1.157		-1	T	25		
		1.240		0				
		1.630		+2	CR			2R
		1.810			T	38		

APPENDIX A

from the ending odometer of the recorded section concerned.

4. LENGTH OF CHORD OF CURVE

For every given central angle of a curve there is a definite ratio that the length of the chord bears to the arc or circular segment. By matching these ratios to the central angles by groups, mass calculations are made on the arcs or curve intervening distance, and the length of chord is established. This length is necessary in order to convert all points of recorded data to equivalent X and Y coordinate values.

5. SAFE DRIVING SPEEDS ON CURVES

The formula * for estimating safe driving speeds on curves might seem to pose difficulties in the IBM mechanical calculation machines. This is not so, for the 602 calculating punch machine can do an unbelievable number of additions, subtractions, multiplications and divisions, take the result and operate upon it etc., etc. This makes the calculation of the expression $\frac{R(S-0.16)}{.067}$ a very simple one. However, though it can be made to do it, the operation of extracting square root is not a practical operation for the number of curves that are encountered in a project. Instead the results are grouped and the proper speed is punched on cards by consulting a table of squares.

6. RADIUS OF CURVES

As in the chord length calculation there is a definite ratio for each central angle that expresses the relationship of the radius to the arc length. Like central angles are grouped, an operation is made on the arc length and the result is the radius.

7 AND 8. DEPARTURES AND LATITUDES OR X & Y COORDINATE EQUIVALENT LENGTH

At this stage of the procedure all travel has been reduced to equivalent straight lines of which the corresponding direction of travel is known. Knowing these distances and directions, all that is left to do is to apply the proper trigonometric function and reduce all the distances to the X (east west) equivalent and the Y (north south) equivalent. By tabulating a progressive total of these distances a scalable trace is gotten (expressed in 1/1000 mile coordinates) of the actual route covered.

Now in this respect, if the vehicle is brought back to the point of beginning, axiomatically it has gone as far east as it has west, or it has gone as far south as it has north, and the algebraic sum of the latitudes and departures should be zero. If it happens that this algebraic sum is not zero, then the difference or error is taken and applying a proper factor it can be distributed proportionately through all the legs of the traverse concerned.

9. ELEVATION IN FEET

A machine calculation that applies the grade against the distance traveled gives a figure representing the change of elevation between all points. These results can be accumulated and what is seen on the tabulation (*Appendix B*) is a grade profile of elevations expressed in tenths of feet.

DRAFTING THE FINAL TRAVERSE

The final phase of the series of events is that of drafting and tracing a reproducible copy. Coordinates of the trace are gotten from the furnished completed tabulation. These are plotted on 10 x 10 cross section paper usually at a scale of 10 inches to the mile. This is a very convenient scale because the coordinate alignment positions are given in 1/1000 miles which makes each inch a tenth mile and each tenth inch a hundredth mile, etc. As each curve is encountered on the tabulation the radius is scaled off on dividers and the center of curve established. The curve is then drawn in on the hard copy. Tangents between proper points are drawn and topographic detail shown in the "notes" section of the tabulated traverse is delineated. The grade elevations are likewise plotted and plotted points connected. This resulting "hard copy" is then traced to convenient sheets embodying strips of complete administrative sections or is traced in sheets of standard size whichever is the most convenient for the use intended. An example of a print taken from a portion of one of the traverses is included as *Appendix C*.

SOME NOTES ON THE PRACTICAL APPLICATION OF THE GYRO SURVEY TRAVERSE TECHNIQUE

Some 3,000 miles of state highways and county roads have been gyro traversed using the techniques outlined in the body of the report. A large percentage of this mileage was traversed in order to assist the road inventory parties in establishing the proper alignment of roads on county maps. Some mileage was run in order to provide certain statistical detail for

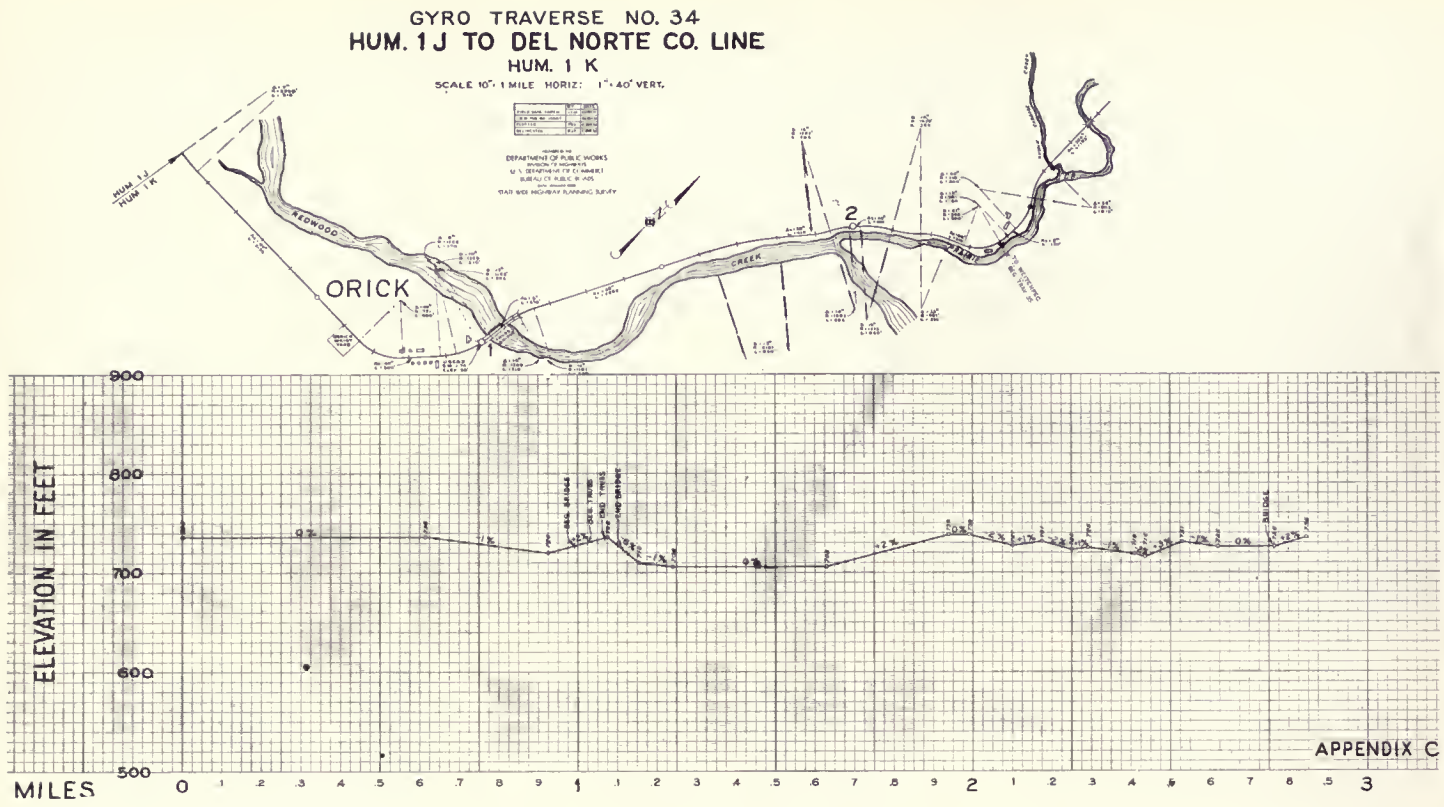
GYROSCOPIC EQUIPMENT - ALIGNMENT AND GRADE SURVEY

	TRAVERSE NOTES														
	TRAVERSE NO 34 NORTH ON NUM 1 K TIME 1300 23 MAY 51													80775	89081	7362
	MCW MARTIN COOL CLOUDY ALIGNMENT TRUE															
	BEGIN BEG NUM 1 K AT ODOMETER 19983 OF TRAVERSE NO 33															
		LL	960													
		CL	925	7	6	L	60		60	2598	92			80834	89078	7362
60		T	890				558		558					81304	89088	7362
618	0BRICK															
618		T	890				22	100	22					81406	89088	7350
640	HWY MTCE STA ON RT															
640		T	890				25	100	25					81430	89088	7337
665		CL	645	49	6	L	125	100	121	771	50			81538	89140	7271
790		T	400				95	100	95					81596	89213	7221
885		CL	350	10	2	L	40	100	40	1209	57			81621	89246	7200
925		LL	300					100								
925		CL	215	17	2	L	67	2	67	1193	57			81641	89308	7221
992	6R 4 2B REDWOOD CR															
992	USCGS BM J74															
992	ELEV 33 FT															
992		LL	130					2								
992		CL	090	8	2	L	32	2	32	1309	57			81646	89340	7305
1024	BEGIN TRUSS															
1024		T	050				46	2	46					81650	89386	7354

APPENDIX B

* $V = \sqrt{\frac{R(S-0.16)}{.067}}$

where V = Safe driving speed in m.p.h.
R = Radius of curve in feet
S = Superelevation in percent and
0.16 = Friction factor.



APPENDIX C

special legislative reports. Still other mileage was run in a research sense.

The results of the operations are quite satisfactory as is shown by the horizontal closures obtained on several large closed circuits. It is interesting to note a few of these.

Circuit	Miles	Error In miles	Error In % of total
Roseville-Lincoln-Newcastle No. 1	33.1	.04	.1
Roseville-Lincoln-Newcastle No. 2	33.1	.1	.3
Roseville-Lincoln-Newcastle No. 3	33.1	.1	.3
San Bernardino County No. 1	85.9	.4	.6
San Bernardino County No. 2	5.3	.1	2.1
San Bernardino County No. 3	29.3	.4	1.4
San Bernardino County No. 4	9.1	.1	.6
Humboldt County No. 1	123.2	1.4	1.2
Humboldt County No. 2	80.0	.4	.6
Humboldt County No. 3	38.5	.2	.6
Humboldt County No. 4	135.9	1.1	.8
Humboldt County No. 5	99.3	1.0	1.0
Humboldt County No. 6	136.1	.8	.6
Humboldt County No. 7	6.3	.1	1.6

It is noted that the percent of error of closure varies from 0.1 percent to 2.1 percent. The magnitude of these errors of closure should not be looked at with too much alarm as a factor can be introduced in the mechanical calculating process and they can be reduced as previously explained. However, such errors may occur or accumulate in traverses that are not closed. For these traverses, corrections can be made based on the established position of triangulation stations that may have been encountered. If such stations are not available, then the traverse should be run a second time either in the same direction or the reverse direction and a correction made based upon such a circuit.

In respect to the accuracy in regard to the taking of grades as outlined in the report, experience to date indicates gratifying results. On a portion of U. S. 101 that was run from the south to the north line of Humboldt County, a distance of 137 miles, a calculated difference of 38 feet in elevation from the true was noted. When the total 385 miles of U. S. 101 from San Francisco north to the Oregon state line was considered, the error in elevation between point of beginning at the Golden Gate Bridge (elevation 241 feet) and the U.S.G.S. Azimuth Mark Hytree in Del Norte County (elevation 63 feet) as registered by the gyro notes was an aggregate of 1,440 feet. The distance between these points is 374 miles.

Wanton Damage

Continued from page 10 . . .

few years, including some of the largest mills in this territory. In addition, many new mills have been built along the westerly section of the highway between Alton and Bridgeville and are using the road for both log and lumber hauling.

One of the strange things to me is that several operators are hauling logs east, over the hump, to Red Bluff and other cities on U. S. Highway 99. We met several of these trucks and it was plainly evident that they were all overloaded.

Tricks of Trade

Nash stopped and talked to one logging superintendent and asked him why he was overloading and the superintendent asked if the load law held on secondary roads. That may give you an idea of how much attention some of those loggers are paying to our highways.

One of the loggers hauling east over the hump let a cat out of the bag. He told us that they stopped at some small

. . . *Continued on page 43*

Dr. L. I. Hewes Award for Outstanding Contribution to Highway Development



State Highway Engineer George T. McCoy, right, presents to James T. McWilliam, Assistant Highway Engineer, the Dr. L. I. Hewes award

THE WESTERN Association of State Highway Officials, meeting in Seattle in June, 1952, announced the first recipients of the Dr. L. I. Hewes award for outstanding contribution to western highway development. The award, established last year to honor the memory and achievements of the late Western Regional Chief of the U. S. Bureau of Public Roads, was shared by two men, one from the State of Washington and the other from California.

The California recipient was James T. McWilliam, Assistant Highway Engineer. His contribution to highway development which earned him the award plaque and half the annual $500 prize which accompanies it was in connection with the use of gyroscopic equipment.

McWilliam Devised Methods

McWilliam was only one of several Planning Department staff engineers who participated in the development of the equipment and in perfecting its use in the field. His nomination for the Hewes award was based primarily on his devising and applying methods for using modern tabulating machines to process the field notes obtained with the gyroscopic equipment. The calculation of survey notes by tabulating machines instead of traditional methods made it possible to complete a rapid survey of a road in a matter of days instead of weeks.

Both his educational background and his experience provided the knowledge which McWilliam put to effective use in using tabulating machines for the survey computations. He has had more than 20 years of experience in surveying and highway engineering work, and was graduated from the University of California with a bachelor of arts degree, with mathematics as his major.

McWilliam was born in Pleasant Grove, Sutter County, in 1909, and attended schools in his native county and in Sacramento. He was engaged in surveying between 1924 and 1930, and then entered the university. He was graduated in 1934, and in 1936 joined the California Division of Highways. After working in District X (Stockton) for a few years, he was transferred to Headquarters Office in 1939, and assigned to the state-wide highway planning survey. He has remained with that unit since, except for active military service from 1940 to 1947, most of it with an engineer topographic unit.

Major in Army Reserve

Currently he is a major in the 381st Engineer Maintenance and Supply Group, U. S. Army Reserve. Since May of this year, he has been assigned to work with the Automotive Safety Foundation staff which is conducting a survey of California highway needs and deficiencies under the supervision of the Legislature's Joint Fact-Finding Committee on Highways.

The award was accepted in Seattle on McWilliam's behalf by R. M. Gillis, Deputy State Highway Engineer. The presentation in Sacramento of the plaque and the money award was made to the recipient by State Highway Engineer G. T. McCoy, who had nominated McWilliam for the award.

The corecipient of the Dr. L. I. Hewes award for 1952 was H. W. Humphres, District Soils Engineer for the Washington Department of Highways, whose contribution to highway development was in the field of preventing landslides on mountain highways through the design of drainage systems based on soil testing.

The Dr. L. I. Hewes award was instituted and funds were provided by *Western Construction* magazine.

Big accidents may make the headlines, but it's the little ones that annoy most of us while driving. It is a simple matter to avoid most minor accidents. Courteous and careful driving will usually do the trick.

RECENT RAISED TRAFFIC BAR DEVELOPMENTS

By BLAIR GEDDES, District Traffic Engineer, District III

In the November, 1942, issue of *California Highways and Public Works*, a report was made of new methods then developed for placing raised traffic bars composed of asphalt concrete, in lieu of plant mix, because of the difficulty of placing and maintaining the plant mix bars.

Bars were placed on the two projects at that time, which were 8 inches wide by 3 inches high in San Francisco and 6 inches wide by 1½ inches high in Daly City.

In 1946, John E. Perry, of San Francisco, called at the District IV office with samples of a fiber concrete which he had developed, and discussed with the writer possible uses of the material for highway purposes. It was suggested that the material, which developed high tensile and compressive strengths, although weighing only 50 pounds per cubic foot, might be used for precast traffic bars.

New Industry Born

Some bars were cast, trial installations were made at several locations and a new industry was born. The next four years were required to solve several related problems pertaining to the development of a proper cementing agent, a paint that would adequately bond to the material and the elimination of curl in the bar, which lifted the ends of the bar, breaking the bond with the cementing agent. Each of these problems was successfully overcome and the product proved so satisfactory that the Division of Highways adopted an "in lieu" specification allowing these precast bars to be substituted for the types covered in its Standard Specifications for the standard 3-inch high bar.

In the interim, several experiments were conducted on a 1-inch bar of the precast type but because of the difficulties of handling and placing, particularly where the pavement surface had slight irregularities, satisfactory results were not obtained. In addition, the rising labor costs indicated that a different approach to the problem should be investigated. The fiber concrete bars were being precast by the extrusion method and the question was raised as to why they could not be extruded into place rather than cast and then placed.

Further Experimentation

Further experimentation followed and during 1951 a pilot model of the necessary machine was completed. For the machine casting in place a new material mix was devised which would provide for rapid setting time. On May 21, 1952, the maiden flight of the machine was consummated and the installation pictured in the accompanying photographs was made.

The truck-mounted mixer is of the continuous type and proportions the dry material and water into a rotating

This photo shows completed traffic bars in foreground and work proceeding on "T" bar along pavement center line





UPPER LEFT—John Perry explains the features of the costing carriage, operated by Ed Pirro, to the author, on right. UPPER RIGHT—Proportioning and mixing machine mounted on truck. Hose to costing carriage comes out from below truck frome directly below mixing chamber. LOWER LEFT—Applying cementing agent to pavement immediately ahead of costing. LOWER RIGHT—Casting corriage in operation. Yoke handle raises nozzle when pump is stopped.

paddle-mixing chamber. A pump at the bottom of the mixing chamber, electrically controlled by the forming carriage operator, delivers the material through a plastic hose to the casting shoe. The material control to the mixing chamber is connected to the discharge pump and the mixing chamber only receives material when the pump is actually discharging.

Tests Are Made

The materials used consisted of white Monterey sand, white cement and an addative developed by Mr. Perry. By varying this addative, the setting time of the mixture can be varied from a low of 15 minutes to 4 hours. On this installation, a mix with a 1-hour setting time was used.

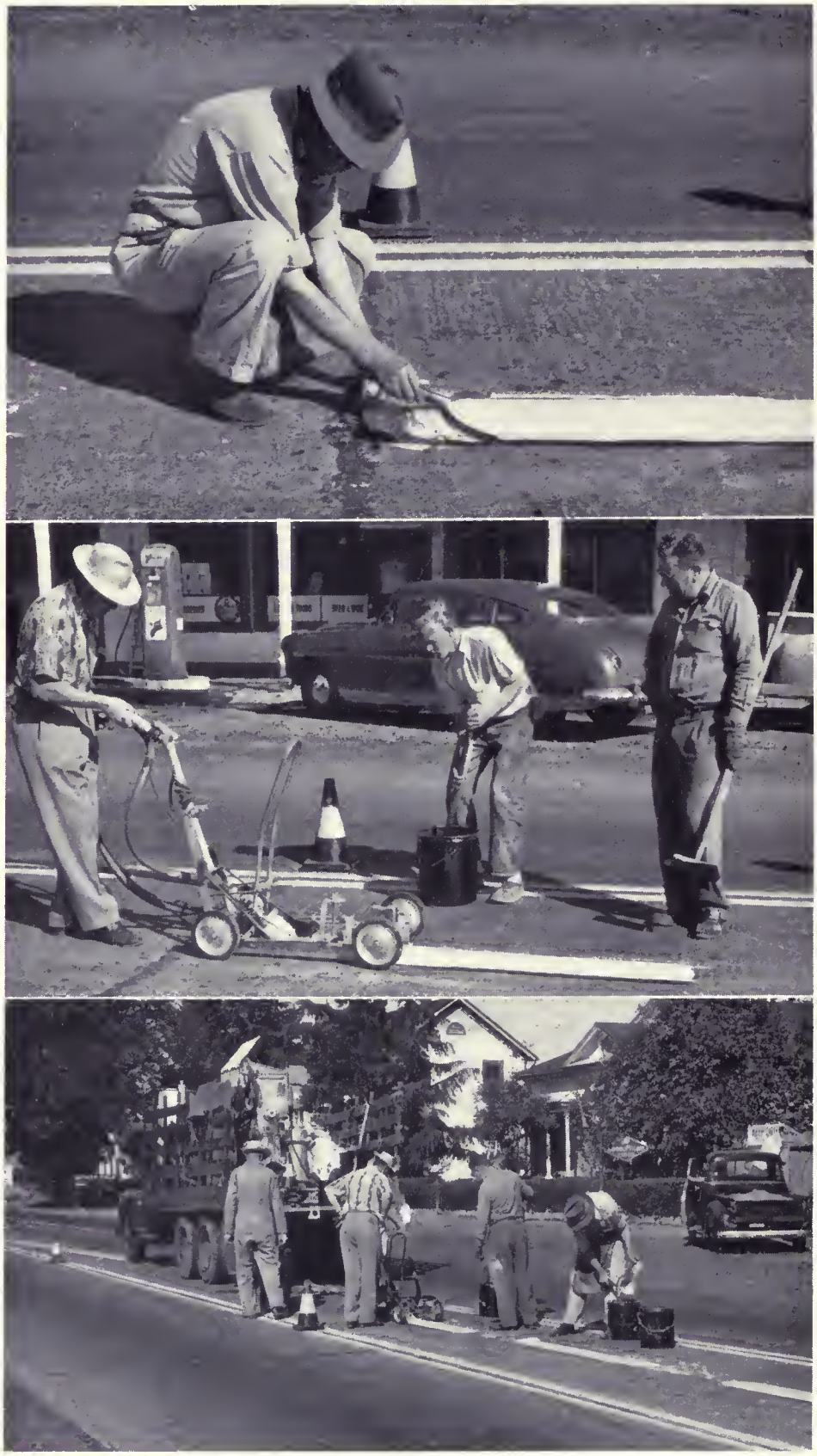
Two experimental projects were set up by District III for tests of the new method. The one here pictured consisted of delineating a left turn storage lane on existing Portland cement concrete on U. S. 50 at the main entrance to Mather Air Force Base. The second project consisted of two intersections on State Sign Route 49 between Auburn and Grass Valley at the main and freight entrances to DeWitt State Hospital. These installations delineated left turn storage lanes on a plant mixed surfacing.

Operators Learn Machine

By the time the installation at the main entrance to DeWitt State Hospital was made (the third intersection), the operators were fully acquainted with the characteristics of the machine and had developed an efficient procedure. The installation consisted of 404 feet of raised bar varying in length from a minimum of 2 feet to a maximum of 12 feet per bar. The majority of the bars were of 2 feet to 4 feet in length with only a very few falling in the 4-foot to 12-foot category. The elapsed time from start to finish of casting of this installation was 42 minutes.

The entire installation including laying out and clean up required less than four hours with a crew of seven men. With further development of the casting carriage to incorporate mechanical end forming of the bars and spray application of the cementing

. . . Continued on page 35



UPPER—Trimming end of a recently cast bar. CENTER—Side view of casting carriage. Buttons on the handle control the delivery pump including a reverse pumping to eliminate slobber from the nazzle. LOWER—General view of the operation. End trimming is done immediately following casting.

Montalvo Freeway

Last Link Connecting Oxnard and Ventura

By MILTON F. MASTERS, Senior Highway Engineer

Prior to World War II, U. S. Route 101 and U. S. 101 Alternate between Oxnard and Ventura consisted of a three-lane roadway which at that time was adequate for both local and through traffic. The 1940 census showed the population of Oxnard and Ventura to be 8,519 and 13,264 respectively.

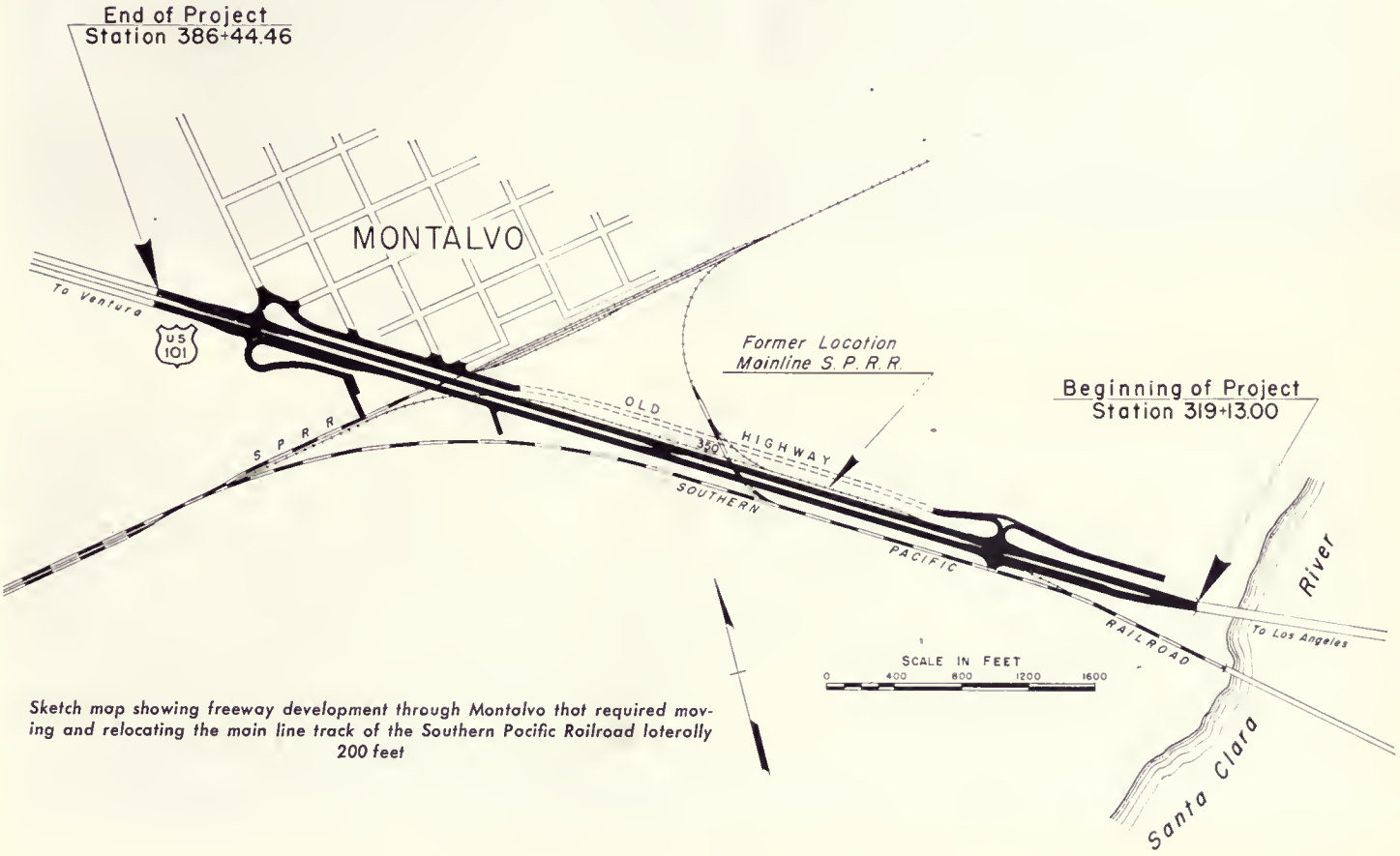
Shortly after that fateful day on December 7, 1941, when the Japanese attacked Pearl Harbor, the Federal Government started a rapid and extensive expansion of naval facilities including the installations at Point Mugu and at Port Hueneme in the vicinity of Oxnard. This expansion program, particularly at Point Mugu, has continued even after the cessation of hostilities and up to the present day. The large influx of military personnel and complementary civilian personnel to man these installations, plus the natural growth in this area, caused a rapid increase in population as indicated by the 1950 census. The last census showed the population of Oxnard to be 21,567, and Ventura was close behind with 16,532. Oxnard is still rapidly expanding and the estimated population for Oxnard at the end of 1952 is 24,496.

Increase in Traffic

Paralleling this phenomenal population increase was a corresponding increase in traffic density on the connecting coastal highway between these two cities. For comparison, the following data is shown from district traffic counts through Montalvo, which is approximately halfway between Oxnard and Ventura:

	1940	1951
Average daily traffic (both directions)	10,000	20,700
Peak hourly traffic (both directions)	1,290	2,685

After World War II, when highway construction was renewed, work was started in Ventura County to convert this existing three-lane facility to a four-lane divided highway. The first contract was let to J. E. Haddock, Ltd., in February of 1947 and consisted of improving the section between Montalvo and Ventura, a distance of 3.4



Sketch map showing freeway development through Montalvo that required moving and relocating the main line track of the Southern Pacific Railroad laterally 200 feet



Looking southeosterly along U. S. 101 Alt. toward Oxnard, showing grade separation underpass with moin line of Southern Pacific Roilrood



Looking southeasterly olong freeway through Montolvo toward Santa Clara River bridge, showing business development along old highway on left and relocated Southern Pacific tracks on right

Completed section of four-lane divided highway through Montolvo





Looking northwesterly toward Ventura along completed freeway. Main line track of Southern Pacific in relocated position at extreme left.



Looking southeasterly at El Rio channelized intersection between U. S. 101 and U. S. 101 Alt.

miles at a construction cost of $601,-139. This contract was completed in December of 1947.

Four-lane Divided Highway

In February of 1948 a section of 1.3 miles, including the junction of U. S. Route 101 and U. S. 101 Alternate at El Rio, was let to contract to provide a four-lane divided highway with channelization islands and frontage roads. This contract was completed in the latter part of 1948 by the Smith-Edmondson Company at a cost of $169,552.

An additional bridge span to widen the existing grade separation underpass of the Southern Pacific Railroad near El Rio was let to contract in November of 1948 to Grant L. Miner at a cost of $122,345. This project was completed in the early summer of 1949 and provided the required width for the highway contract of 2.1 miles let in June of 1949 to Griffith Co. of Los Angeles. This last project provided for the improvement of the existing three-lane highway to a four-lane divided section from the north city limits of Oxnard to connect to the Smith-Edmondson Co. contract previously mentioned. This was completed in the spring of 1950 at a construction cost of $238,518.

The above-mentioned contracts completed the four-lane divided construction between Oxnard and Ventura with the exception of 1.3 miles between the Santa Clara River Bridge and the northerly limits of Montalvo. In the meantime the exceptionally heavy morning and evening commuter traffic to Point Mugu and Port Hueneme sorely taxed the capacity of this one



The photograph above and the one below show two additional sections of the freeway through Montalvo

remaining stretch of three-lane pavement. Because of this traffic bottleneck, it was not an uncommon sight during the morning and evening peak hours to see traffic packed bumper to bumper through this section.

Right of Way Problem

The State Division of Highways was confronted with a difficult problem in acquiring the right of way through Montavlo to provide a limited access freeway section with necessary adjacent frontage roads. For most of the distance the main-line tracks of the Southern Pacific Railroad were close to the existing highway on the southwesterly side, whereas residences, small businesses, and industries were close to the highway on the northeasterly side. To widen on the northeasterly side would have meant the wiping out of all the highway frontage development, whereas to widen on the southwesterly side would require moving the main-line railroad tracks. It was found more economical to move the railroad and to acquire the needed right of way from the agricultural lands on the southwesterly side.

Negotiations were started early in 1949 but it was not until March of 1951, after an agreement had been reached between the State and the Southern Pacific Railroad, that the railroad company let a contract to Baker & Pollock of Ventura to relocate their facilities. The railroad relocation included the construction of railroad embankment and drainage structures for approximately 6,000 linear feet of new main-line track, and some adjustments to the Santa Paula Branch line and "Y" track crossings at Montalvo. This relocation was financed by state funds.

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Retirements *from* Service

EDWARD L. EVANS

After 45 years of engineering work, 24 years with the California Division of Highways, Edward L. Evans, Supervising Highway Engineer, retired on July 1, 1952.

Evans was educated in the public schools of Wyoming and was graduated from the South Dakota State School of Mines in 1907. His first few years after graduation followed the pattern of most young engineers of that period, commuting from state to state as the short seasonal jobs were completed. Briefly, this consisted of about one year on railroad survey parties in Nevada, California, and Oregon and three years on irrigation projects in California and Wyoming, followed by three years on subdivision work in the San Francisco Bay area.



EDWARD L. EVANS

Worked in Arizona

Moving to Arizona, the next five years were spent working for the mining companies and on state and county highway work.

In 1918, Mr. Evans opened an office in Globe, Arizona, and engaged in the private practice of engineering and contracting in Arizona and Southern California, specializing in the surveying of mining claims. In addition to survey work, contracts were entered into and completed for paving city streets in San Bernardino, constructing a sewer system in Globe, Arizona, and constructing a one-mile section of the well-known Miami-Superior Highway through the Superstition Mountains east of Phoenix.

The early 1920's were depression years in Arizona with the three "C's"

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T. A. ROSEBERRY

A luncheon was given on May 28th at the Imperial Cafe on Garden Grove Boulevard, Orange County, for T. A. Roseberry, who retired from the Division of Highways, District VII, on May 31, 1952, after 29 years' service.

Present to honor Mr. Roseberry were District Engineer W. L. Fahey, Assistant District Engineer F. B. Cressy, Assistant District Engineer A. D. Griffin, retired members C. N. Ainley, W. D. Eaton, C. P. Montgomery, E. R. Seitz, T. C. Peterson, and some 40 other friends and associates. P. O. Harding, Assistant State Highway Engineer, sent a letter expressing his regret at being unable to attend, his appreciation of Mr. Roseberry's years of service, and his good wishes.

Congratulations and Gifts

A booklet, extending congratulations on his years of devoted service and best wishes for his future happiness, over the signatures of many of his friends, and containing a brief illustrated history of his engineering experience, had been prepared for presentation to Mr. Roseberry on this occasion. Bill Fahey, who presented the booklet, supplied full and complete details regarding the illustrations, which covered some of the more humorous incidents of Mr. Roseberry's career as a highway engineer.

A gold wrist watch, suitably inscribed to commemorate the occasion, which had been purchased with funds contributed by his friends, was presented to the guest of honor by Frank Cressy.

Mr. Griffin recalled some of the incidents on the contract to which Mr. Roseberry was assigned as his assistant when he first came to District VII 27 years ago.

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EDWIN B. NORMINGTON

August 1, 1952, marked the end of over 30 consecutive years of service with the Equipment Department of the Division of Highways for genial Edwin B. Normington, automobile electrician leadman at Headquarters Shop in Sacramento.



EDWIN B. NORMINGTON

Since his entry into state service on March 6, 1922, Mr. Normington has been in charge of the installation and maintenance of electrical equipment in highway shops and of steam-heating plants in highway maintenance stations throughout California.

Ed was born in Bellevue, Idaho, in 1889. When he was four years old, his parents moved to Sacramento, making the entire trip in a covered wagon. Their stay in Sacramento was short and for the next few years the family lived in the gold towns of Amador County, but eventually moved to Auburn.

In Auburn, Ed went to work on his first job in the largest blacksmith shop in town. Here he learned to shoe horses and to build and repair wagons and carriages.

When the family moved to Sacramento in 1906, Ed went to work for the Pacific Gas and Electric Company in the local car shops, where the once familiar yellow streetcars used in Sacramento were built, as well as many of those used in Fresno and San Jose. It was here that Ed learned the trade of electrician. Later, when the company began to purchase automobiles, he was put in charge of the maintenance of these new, modern units of transportation.

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EDWARD L. EVANS

Continued from page 27 . . .

—copper, cattle and cotton—all hitting the toboggan. In 1922, Mr. Evans was engaged by the Riverside Portland Cement Company on the survey of placer mining claims, the preparation of topographic maps and supervision of diamond drilling operations on limestone and clay deposits at various locations in Arizona. The following year, he accepted a position as chief civil engineer with this company in the reconstruction, enlargement and operation of the cement plants at Riverside and Oro Grange in Southern California.

Enters State Services

In August, 1928, he entered state service as assistant resident engineer on highway work in San Diego County and was promoted to resident engineer the following February. During the next seven years, he was employed as resident engineer in Districts III, VII, and XI. In June of 1936, he transferred to headquarters office and accepted a position preparing specifications under R. H. Wilson, at that time office engineer. Mr. Evans has remained in this department for the past 16 years, advancing from associate highway engineer to supervising highway engineer.

After catching up on his hunting and fishing, he will be available for consultation on highway and other engineering problems.

T. A. ROSEBERRY

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Born in California

Mr. Roseberry is a native son, having been born at Adin, Modoc County, California. He began his engineering career as chainman for the U. S. Indian Service in 1900. A couple of years of this work was sufficient to develop a considerable portion of bona fide S. I. blood in his veins, and he decided that some formal engineering training was in order. The next two years were spent at the Van der Naillen Engineering School at San Francisco, after which he resumed work with the U. S. Indian Service as transitman.

During the year 1906, "Rosey" came down with "gold fever" and spent the next seven years in the mining country at Rawhide, Nevada, overcoming this malady.

The years 1913 to 1918 were spent mostly on survey work, chiefly for the County Surveyor of Lassen County.

In July, 1918, "Rosey" began his service with the State Division of Highways in District II. He worked as instrument man on survey party, draftsman in the district office, and as Assistant Resident Engineer. Resigning his position in 1920, he spent the next five years in the Engineering Department of the Southern Pacific Company at Dunsmuir. In 1925 he returned to the Division of Highways in District VII, where he was employed as Assistant Resident Engineer.

ORA T. EASTERDAY

A specifications writer for the Division of Highways since August, 1928, Ora T. Easterday retired from state service on July 31 of this year.

When Mr. Easterday began his employment with the State in 1928, the annual value of highway construction work amounted to less than $20,000,000. Last year, comparable work put under way by the Division of Highways totaled more than $108,000,000. In 1928, the mileage of highways in the state system aggregated approximately 4,100. Today the total is 14,000 miles.



ORA T. EASTERDAY

Mr. Easterday came to California from Michigan in 1913 and was employed by the City Engineering Department of Sacramento under Albert Givan, City Engineer. In 1914, the late Frank C. Miller was named city engineer and in 1915, Mr. Easterday was appointed chief draftsman.

Because of the ill health of his parents, Mr. Easterday returned to his old home in Michigan in 1918 and was employed as assistant to the plant engineer of a unit of the Union Carbide Company. Upon his return to Sacramento in 1928, he worked temporarily for the late Joseph Gross, consulting engineer on irrigation projects, and then accepted employment with the Division of Highways as a specifications writer under L. V. Campbell, now Engineer of City and Cooperative Projects.

HORACE M. STURGES

Horace M. Sturges, Associate Bridge Engineer of the Bridge Department, retired from state service June 30, 1952.

Mr. Sturges was born September 16, 1887, at Kansas City, Mo. His family later moved to Chillicothe, Mo., where he attended school. He came to California shortly after the turn of the century. From 1910 to 1918 he was engaged in bridge construction with various contractors located in the San Francisco area. From 1918 to 1919 he was in the Air Service, U. S. A., stationed at Mather Field. Following the war he worked for shipbuilding companies in Oakland.

His state service started July, 1921, with District III. He worked with District III, State Reclamation Board and Bridge Department until March, 1926, when he resigned.

In 1930 he was married to Miss May Danforth, a teacher in Sacramento schools.

He returned to work for the Division of Highways in 1930, working for District III. From 1934 to 1936 he worked for the laboratory inspecting steel fabrication for the Bay Bridge.

In January, 1936, he went to work for the Bridge Department and has been with the Bridge Department continuously since that time to the date of his retirement. His assignments have been both in the field and in the office.

Mr. Sturges enjoys the outdoors, particularly hunting, in which sport he can now indulge to the limit without any limitation on his vacation period. He is also very active in community church work and undoubtedly will keep himself well occupied during his retirement.

Through his long years of service he has made many friends in the Bridge Department and throughout the Division of Highways organization.

Early Contract

Martin C. Polk Recalls Yuba County Highway Project in 1912

ALTHOUGH an official breaking of ground for the start of construction under the State Highway Act of 1909, the first of three highway bond acts in California, took place in San Mateo County on August 7, 1912, old time road builders recall that the first actual turning of earth on an early bond-financed California highway project took place in Yuba County a full month earlier.

The start of work on State Highway Contract No. 1, for 5.4 miles between Burlingame and South San Francisco (U. S. 101), was the occasion for a well publicized celebration in which the history-making shovelful of earth was manipulated by Burton A. Towne, first chairman of the California Highway Commission.

But by that time grading was already well under way on Contract No. 4, south of Marysville on what is now U. S. 99E. It had begun on July 7th or 8th, without benefit of officialdom or photographers. Two members of the subcontracting firm on the grading portion of the project held a mule-drawn plow as it bit into the earth alongside the railroad tracks near Morrison's Crossing, three miles northwest of Wheatland, and the job was started.

Polk Was There

One of the witnesses to this hitherto unsung bit of state highway history was Martin C. Polk, who was the engineer for the Chico Construction Company. Polk is still active in the engineering profession in Chico, although he passed his eightieth birthday on July 22, 1952.

On May 21, 1912, the California Highway Commission had authorized State Highway Engineer A. B. Fletcher to call for bids on the first four projects on the newly adopted state highway routes. On June 24th, bids were opened on all four. The San Mateo County project was designated as No. 1; a Mendocino County job as No. 2; a Madera County job as No. 3; and the Yuba County project, consisting of about nine miles of bituminous macadam highway, 15 feet wide, as No. 4.



Martin C. Polk, about 1902, shortly after beginning his engineering career

F. E. Frey of Sacramento was low bidder on the Yuba County job, and was awarded the contract by the commission on his bid of $67,780.50. But the commission's action had to be approved by the Advisory Board of the State Department of Engineering before it became official. The Advisory Board took this action on July 23d, which became the official award date. Final approval by the Attorney General took place on July 26th.

Work Is Started

Meanwhile, Frey had arranged with the Chico Construction Company to do the grading. Going on the assumption that final approval of Frey's contract was assured, the Chico firm decided to go ahead at once.

"The president of the firm was William Perley," Polk recalls, "and one of the principal stockholders was Wendell Miller, a banker and rancher who furnished the mule rig for the job. We had heard about plans for an official start of work in San Mateo County, but we saw no reason to delay our own work."

"I don't remember the exact day, but sometime early in July I went down to Morrison's Crossing with Mr. Perley, Mr. Miller, and the foreman, Peter Cuddeback. And while Mr. Perley and Mr. Miller held the plow, the driver started up his six mules and we broke earth for the job."

One record places the start of grading as July 7th; the resident engineer's field notebook (see *illustration*) fixes it as July 8th.

Polk had helped figure the grading job for the Chico firm, but after the work got under way he had only occasional contact with the project. He remembers the resident engineer, H. C. Boyden (whom he recalls best by the nickname "High Pockets" because of his tall stature) as an exacting inspector.

Project Completed 1913

The grading was completed within a few months. Laying of the bituminous macadam surfacing began on August 7, 1912. Work was suspended for about two months during the winter and the road was opened to traffic in July, 1913, with final completion of the project on September 10, 1913.

The final report of the Division (District) Engineer, William S. Caruthers, reflected several problems with which the contractor had to cope, including the two months of wet weather which "softened the ground so as to make hauling out of the question." He also encountered some delays in getting rock screenings.

In accordance with the prevailing practice under the first state highway bond issue, the state funds were available only for construction of the highway. The counties had to furnish the right of way and build the bridges. Yuba County built four bridges in advance of Contract No. 4.

Bridges Tested

The county supervisors questioned the strength of the bridges, and refused to pay for them until they were tested. Resident Engineer Boyden represented the State Highway Commission at the tests, which consisted of using two-horse rollers connected and loaded with sacks of screenings so as to approximate the load of a typical early-day traction engine. From these tests it was concluded that the bridges were satisfactory.

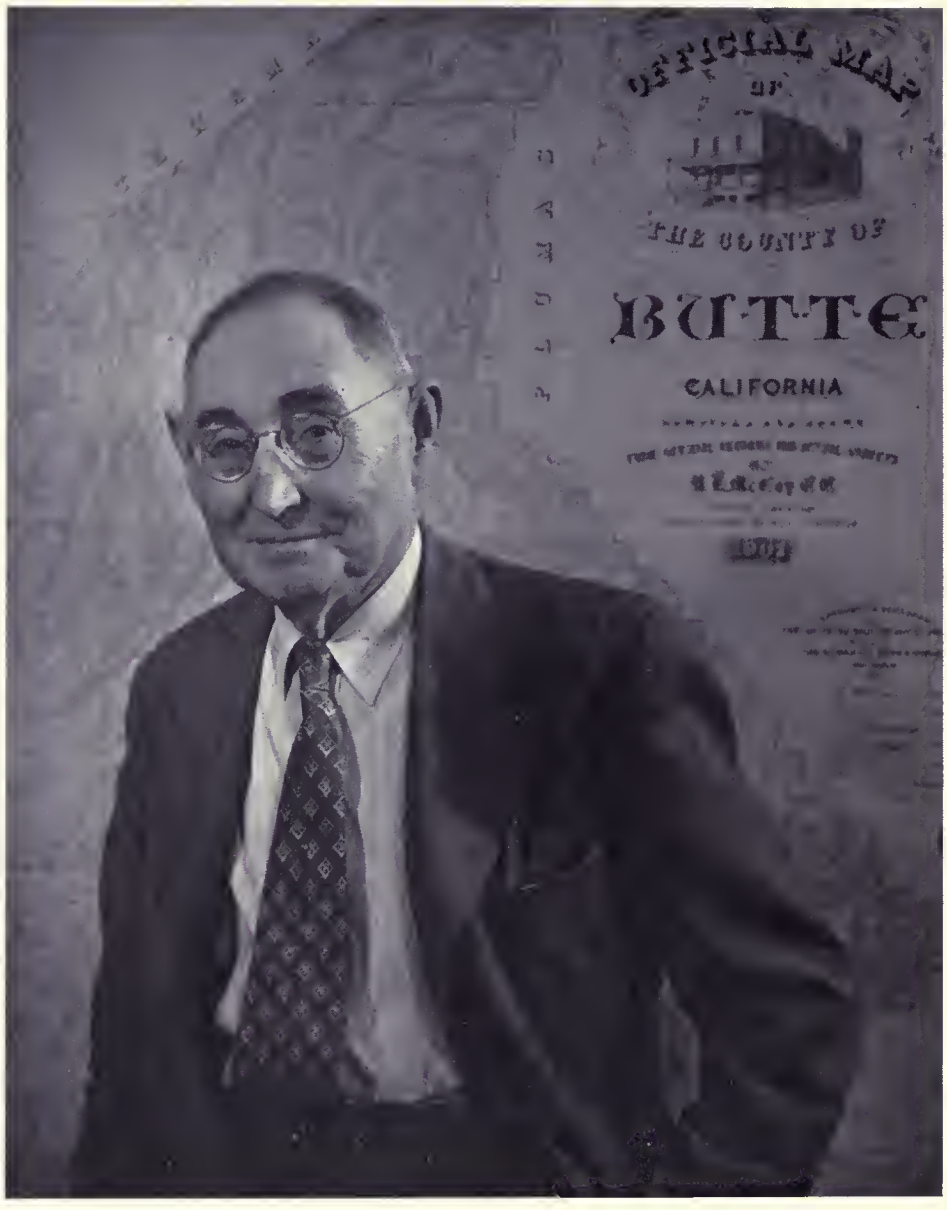
That early-day project south of Marysville was the first of several state highway contracts with which Polk was closely associated. The others occurred a decade later, with Polk acting as contractor.

Actually, his connection with and influence on the development of the State Highway System in the Sacramento Valley and northern Sierra Nevada region stem far more from his frequent role as adviser and consultant than from his contract work. In his various capacities as city engineer, county surveyor, consulting engineer and county assessor over the course of half a century, he has contributed valuable assistance to the Division of Highways.

Early Road Campaign

Polk's active interest in highways has been continuous since June, 1908, when he represented the City of Chico at a meeting called in Stockton for the purpose of dealing with the growing highway problem on a state-wide basis. That meeting was the occasion for the launching by Governor James N. Gillett of the campaign for the first state highway bond issue, and for the organization of the Good Roads Association. Stockton was chosen for the meeting, Polk recalls, because the County of San Joaquin had displayed leadership in road matters.

The veteran engineer literally grew up with his region. Born in Iron County, Missouri, he came to California as a child in 1873. His father was a distant cousin of President James K. Polk. At the end of an 11-day train trip the senior Polk was met in Sacramento by Henry Gerke, owner of the Peter Lassen grant, who offered him a plowing job at his ranch near Vina, Tehama County. A few years later, the family moved to the upland areas to the east, and the name of Polk Springs, in the Deer Creek country, marks one of their homesites.



Martin C. Polk, 1952, standing in front of the official map of Butte County which dates back to the time he began his engineer career at the turn of the century

Enters Stanford

Martin Polk got his basic education in a one-room school at Cohasset, in the Butte-Tehama hill country. A teacher of exceptional ability helped him with advanced studies, including trigonometry, and in 1892 the young man entered California College, a denominational school, in Oakland, where he was graduated in 1894.

During the next three years Polk worked in logging camps and at odd jobs. In 1897 he traveled to Palo Alto, enrolled at Stanford, and crammed all the engineering he could into one academic year—all he could afford on the $100 he had saved, even with the strictest economy in matters of room and board. He returned to Butte County in the spring of 1898, went to work as a sawmill yard foreman, and saved enough to buy a transit. With it he surveyed timber range for the logging company.

In 1901 Polk made the move to Chico and opened an engineering

office. He was just in time. The city was planning a sewer system, and the city engineer took him on as an assistant. The city engineer resigned the following year, and Polk stepped into his post to complete the sewer installation.

First Bond Issue

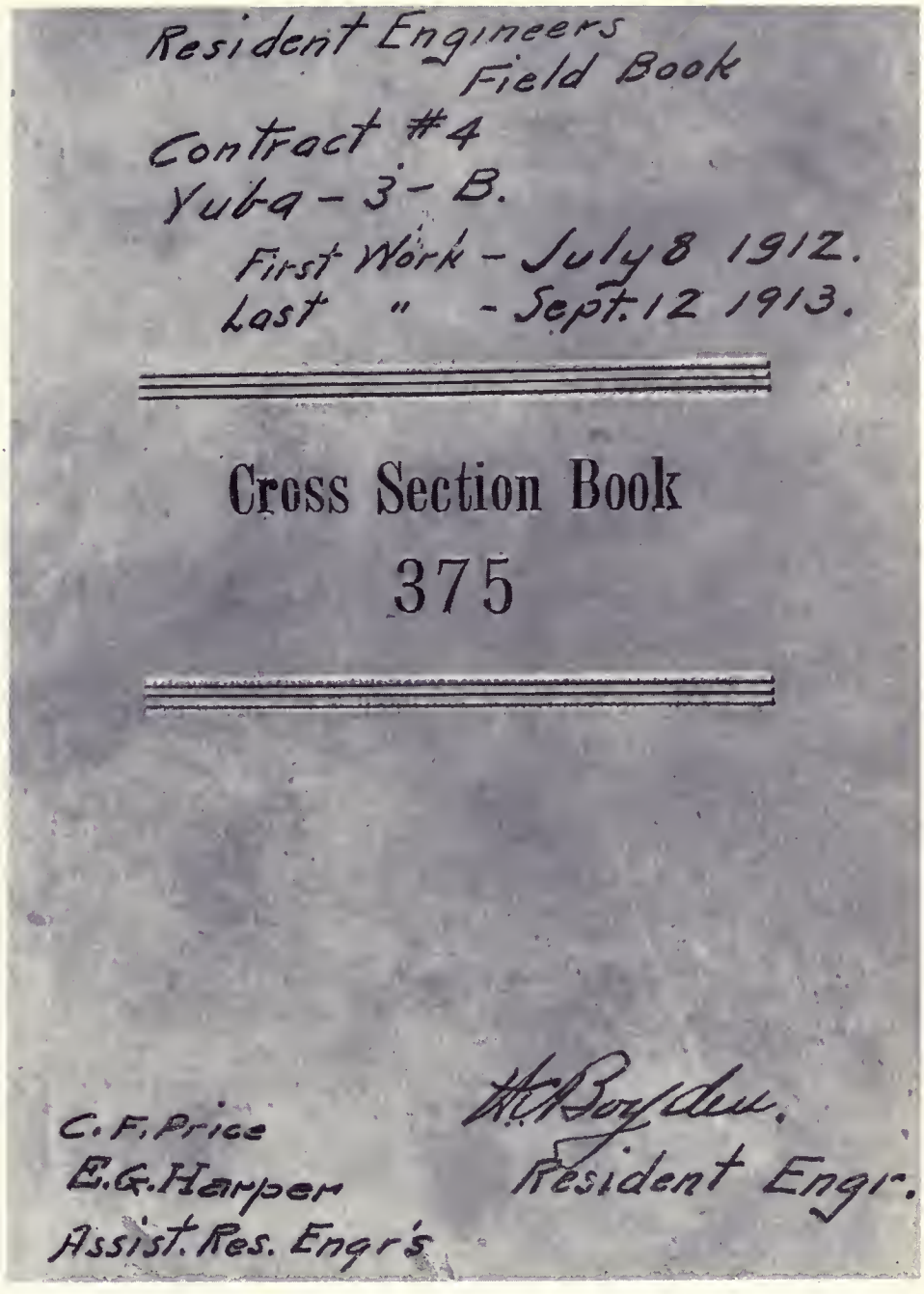
At about the same time he was elected county surveyor, a part-time job. He continued to serve as county surveyor for many years, although he relinquished the Chico city engineer post for a while in order to survey railroad lines for the Diamond Match Company. But in 1908 he was back in his combination city engineer-county surveyor position, and was in the midst of studying street paving methods in various Northern California cities when the first state highway bond issue came up as a result of the Stockton meeting in which Polk took part.

The Yuba County State Highway project was the forerunner of a busy and eventful 20 years of engineering for Polk. He built canals for a number of irrigation and drainage districts which he helped to organize; he played a part in organizing the state-sponsored agricultural colony at Durham; he helped the Western Pacific develop its construction road through the Feather River Canyon, and later, when the Feather River Highway was being planned, walked the canyon for 40 miles with former State District Engineer T. A. Bedford and the late A. W. Keddie, former surveyor of Plumas County. Bedford is now retired and lives in Redding.

Organizes Road Department

His combination Chico-Butte County position ended in 1918, when the county enacted a charter and created the position of road engineer on a full-time basis. Polk resigned then as Chico City Engineer, but took an active part in drafting a new city charter in 1921. He returned to city employment in 1929 as a consulting engineer for the extension of the sewer system and then as city engineer again until 1934.

Polk held the county road engineer post for less than two years, just long enough to organize the road department. Then he concentrated on irrigation district work for the next decade or so, although he again served the county in 1927 as a part-time adviser to the board of supervisors.



Documentory evidence that work on Contract No. 4 started well in advance of others is provided by this photograph of the cover of the resident engineer's field notebook. The book is on file at the District III office of the Division of Highways at Marysville.

Polk built the system of canals for the Sutter-Butte Canal Company which have now been taken over by various irrigation districts in the area. He built them by both day labor and contract, using mules, steam shovels and other available methods and equipment. He operated the canal system for some years with headquarters in Gridley, and developed the extensions of the system into Sutter County.

Enters Contracting Business

He left his home region occasionally, once in 1924 to make a report on the Cuyama River watershed for the

. . . Continued on page 34


Grand Avenue Undercrossing
BR 49-84R&L
Fragment Of Bent
BUENA VISTA BLVD
BR 49-94
BR 49-84R&L
101
IDA ST
GROVE ST
Buena Vista Avenue Overcrossing
BR 49-94
Ida Street Underpass
BR 49-147
FREEWAY THROUG

Traffic Relief

San Luis Obispo Project Nearly Completed

THE City of San Luis Obispo, strategically located on the Coast Highway midway between the great metropolitan areas of Los Angeles and San Francisco, is, and has been for some time, suffering from extreme traffic pains. The heavy traffic load on U. S. 101 passes through the center of San Luis Obispo on narrow city streets, heavy cross traffic on most of the intersecting city streets, heavy pedestrian traffic in the vicinity of the business district, two traffic signals, and two right angle turns.

Congestion has reached the point where many drivers, familiar with conditions, by-pass the congested area and by so doing create a minor problem on other local streets. The congestion within the city is particularly noticeable to through traffic as long stretches of four-lane divided highway exist both north and south of the city.

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Early Contract

Continued from page 31 . . .

ranchers of the Santa Maria Valley in Santa Barbara County, and at other times to serve as expert witness in lawsuits over water rights, particularly in the Sacramento Valley and foothill area. He served as a member of the State Reclamation Board from 1940 to 1943.

With his brother Tom, now a member of the Butte County Board of Supervisors, Polk had a fling at contracting in the 1920's, but the firm failed because of insufficient capitalization. He recalls underbidding Henry Kaiser by $60 on a gravel-laying job between Chester and Westwood. Polk Bros. also built a number of bridges and paved several sections of highway in various parts of Northern California.

Helps Western Pacific

When the Western Pacific's Utah Construction Company was working on its construction road for the Feather River rail route, miners in the area interfered so effectively with the work gangs that Emery Oliver, chief engineer for the railroad, turned to Polk for help. In his capacity as county surveyor, Polk proceeded to swear in Oliver's chiefs of survey parties as deputy surveyors for Butte County; then he and two "viewers" completed a map of the construction road so as to make it an official county road. Before this procedure was completed, however, the Western Pacific and the miners reached mutually satisfactory terms on the value of the latter's claims, and the rail company retained the road for itself.

Polk returned to the Feather River Canyon again in 1917 with Highway District Engineer Bedford. The State Highway Commission was in the process of selecting a route through that portion of the Sierra Nevada, and Surveyor Keddie of Plumas County went to the Butte County supervisors in Oroville with the suggestion that the Utah Construction Company route be recommended.

Feather River Highway Route Picked

Bedford, Polk and Keddie (who was then 75 years old) took the train as far as Pulga, and then walked the construction road for 40 miles, taking two days for the journey. Their decision was made even before they completed it: the highway should follow the river canyon, and not the higher-level construction road. In 1937 Polk had the pleasure of participating in the Feather River Highway dedication ceremony at which Governor Frank F. Merriam officiated.

The slump which struck the engineering profession as well as other occupations in the early 1930's did not spare Martin Polk. There was a vacancy in the Butte County assessor's post, and he ran for it in 1934, winning out over several other candidates by a narrow margin. He retired from this office in July, 1950.

Meanwhile he had formed a partnership with Frank Robinson, who took over the Chico city engineer's job from Polk in 1934, and held it until he died in 1947. Polk then returned as city engineer on a consulting basis, but resigned in 1951 when it was again made a full-time position.

Many Activities

Polk is still a consultant to the City of Chico, but that is the least of his engineering activities. He is city engineer of Biggs, and a consulting engineer for the City of Gridley. At Gridley he has just completed construction of a sewage disposal plant under a $250,000 bond issue, and is now getting the pipe laid for the system.

He is engineer for two irrigation districts (serving one of them since 1927), for three drainage districts and two reclamation districts. Some of them he also serves as secretary.

Polk's office in downtown Chico is a busy one. He is confined to it more now than he likes, but he finally had to make one concession to his otherwise well-carried years: he no longer goes out on survey parties, leaving that to his younger partner, Oscar J. Batham. Naturally, a good deal of his time is also devoted to assisting younger engineers—including those of the Division of Highways—with any problems which may come before them in Butte County. No one else has such a profound knowledge of the region from an engineer's point of view.

His continuing interest in state highway development centers at present on the newly reactivated movement to improve Sign Route 32, the Deer Creek Highway between Chico and Lake Almanor, to modern standards.

Polk's son, Martin, Jr., is an employee of the Division of Highways, working in the Right of Way Department of District III, with headquarters at Marysville.

PROGRESS OF THE STATE HIGHWAY IN YUBA

The Natomas Consolidated is filling an order placed by Contractor Frey, who is building a 10-mile strip of the state highway from Marysville southward, of 24,000 tons of crushed rock. The first shipment of the material was made August 5, 1912. Up to the present time, something over 7,225 tons have been delivered.

Contractor Frey has graded over eight of the 10 miles which he has contracted to construct, and at this time has about three miles covered with rock, leveled and rolled, ready to be surfaced with oil and screenings.—From *California Highway Bulletin*, Volume I, Number 1, October 15, 1912.

PUBLIC WORKS CONVENTION

The 58th annual Congress and Equipment Show to be held in Los Angeles by the American Public Works Association from August 24th to 27th promises to be the largest in attendance and interest ever held by the organization composed of city engineers and public works officials of virtually every city, county and state in the United States, according to Donald F. Herrick, executive secretary of the association, and Harry S. Swearingen of the Board of Public Works of the City of Los Angeles, general chairman of the meeting.

The official headquarters hotel for the convention will be the Amabassador Hotel and meetings will be held in the exhibit hall at the Shrine Auditorium. Free and continuous bus service will be available between the two points for registered delegates and their families.

Montalvo

Continued from page 26 . . .

Railroad Contract

The railroad contract was completed within the 90-day time limit and the State immediately thereafter called for bids for the new highway construction through Montalvo. This project, extending from the northerly abutment of the Santa Clara River Bridge to the northerly limits of Montalvo, a distance of 1.3 miles, was awarded to Fredericksen and Kasler of Sacramento on May 23, 1951. The new highway parallels the old highway; however, the numerous existing curves were eliminated by the improved alignment. Portions of the old road remain as a frontage road on the northeasterly side and with the additional new construction of frontage roads provide ample local traffic facilities for this area.

In the past this area has been subjected to considerable flooding from storm run-off waters originating in the range of mountains northeasterly of Montalvo. This problem has been aggravated by the recent numerous tract developments in this area, with a consequent increase in surface run-off. To meet this problem, considerable work was included in the contract to provide adequate drainage, and the grade of the new highway was established higher than the old highway.

Typical Section

The typical section for this project provided for 0.33 feet of plant-mixed surfacing on 0.67 feet of plant-mixed cement treated base, overlying 0.50 feet of imported subbase material. As the amount of roadway excavation was small, the deficiency borrow for the embankment construction was set up as a contract item and designated as "Imported Borrow." The contractor elected to obtain all the imported materials from the nearby commercial plants that produce their aggregates from the Santa Clara River bottom. These materials were of excellent quality and very satisfactory in all respects. The plant-mixed surfacing was subcontracted to the El Rio Rock Company, which also obtained its mineral aggregates from the Santa Clara River.

This project was completed on April 18, 1952, at a construction cost of $397,650, and it was surely a happy day for the thousands of commuters between Oxnard and Ventura to be able to make this trip without a case of jangled nerves from the old traffic "bottleneck."

The contract was ably supervised for the contractor by Superintendents Mel Stover and Jeff Kasler. The writer was resident engineer under the supervision of Frank B. Cressy, Assistant District Engineer in charge of construction in District VII, and C. P. Montgomery, who recently retired from state service.

Everyone knows that there are too many cars on the highways at peak hours. Whenever possible choose the off-hours when traffic is lightest to do your driving. Plan your trip so you do most of your driving early in the day.

In Memoriam

HENRY F. MEIER

Henry F. Meier of Courtland, Sacramento County, a highway maintenance foreman in District III, died June 13th in the Veterans Administration Hospital in Oakland following a lingering illness.

Born in Meridian, Sutter County, on May 4, 1891, Mr. Meier had been employed by the Division of Highways since July, 1935, when he went to work as a highway equipment operator in Marysville. He was made a foreman in 1945, with responsibility for maintenance of State Sign Route 24 along the Sacramento River from Isleton to Hood.

A veteran of World War I, Mr. Meier was a member of both the Veterans of Foreign Wars and the American Legion. He also was a member of the Native Sons of the Golden West.

Surviving are his mother, Mrs. Caroline Meier; a daughter, Mrs. Melba Crozier; a grandson, Robert Henry Crozier; and four sisters, Mrs. Eda Judy, Mrs. Mathilda Manville, Mrs. Lydia Hess, and Mrs. Frieda McDaniel.

Raised Traffic Bars

Continued from page 22 . . .

agent in place of hand mopping, the crew can be substantially reduced and over-all time cut.

Barrings Expected

Cost per foot for these experimental installations was comparable to unit bid prices on plant mixed bars in the same areas. With additional experience in operating the machine and with the addition of the previously mentioned mechanical features, it is anticipated that a substantial reduction will be made in completed cost.

Initial cost, however, is not the ruling criterion. From present indications, it is evident that maintenance costs on these bars will be only a fraction of the cost of maintaining bars made of asphaltic products, particularly with reference to the paint.

The most significant value of this development, however, is in the elimination of inconvenience to the traveling public. A complete raised bar channelization can be installed between the morning and evening traffic peaks during the lighter traffic period of the day, and be turned over to full use within an hour after completion without protective barricades, lights, flares or other barriers. Plant-mix bars require several days for curing, sealing and painting after original placing before they can be opened to full traffic use. It may be that this is the solution for making installations where the minimum of time, equipment on the traveled way, and inconvenience to the traveling public is to be considered.

USEFUL TO COLLEGE

COMPTON COLLEGE
Compton 3, California

KENNETH C. ADAMS, *Editor*

DEAR EDITOR: I am writing to again express the appreciation of myself and our institution for your magazine, *California Highways and Public Works*, during the past school year.

This publication has been circulated in our economic and government classes, now numbering in excess of 600 students. We find such material to be of practical value in supplementing the basic course content.

Cordially yours,

ROBERT C. GILLINGHAM, Chairman
Social Science Department

Santa Ana Canyon

Widening to Four-lane Highway Is Completed

By W. M. McKNIGHT, Resident Engineer

THE LAST link in the four-lane divided highway through Santa Ana Canyon, locally called the "Santa Ana Canyon Road," was completed on June 10, 1952, by Contractor A. Teichert & Son, Inc., of Sacramento, California.

This State Division of Highways Contract No. 51-7VC37-F is located in Orange County on State Sign Route 18. This route is an important arterial connecting the cities of Riverside and San Bernardino Counties with the harbor areas and beaches of Los Angeles and Orange Counties. A large volume of truck traffic and considerable through traffic utilize this route.

The Santa Ana Canyon Road, originally constructed by Orange County, was adopted as a state highway in 1934 and was later declared a freeway by resolution of the State Highway Commission on December 19, 1947.

Converted to Divided Highway

The work done under this contract consisted of constructing a graded roadbed parallel to the existing highway, reconstructing portions of the existing highway on revised alignment and grade, and widening and resurfacing other portions of the existing highway to provide a four-lane divided highway. Plant mix surfacing was placed on existing pavement and on cement-treated base over a subbase of selected material. The two existing bridges within the job limits, Gypsum Creek Bridge and Coal Creek Bridge, were both widened to provide an additional clear roadway 37 feet wide for use by westbound traffic. This bridge construction work was under the supervision of Don Alden, Bridge Department representative.

The contract was approved on March 7, 1951, and the contractor began work the following day. There were 255 working days allowed under the contract. A total of 280 days were used to complete the contract. Due to the extremely severe winter rains 34 days were credited as nonworking due to weather or conditions resulting therefrom.

This contract had the distinction of having, at different times, three superintendents and two resident engineers. The superintendents for A. Teichert & Son, Inc., were L. F. deStwolinski, A. Bauer, and R. Skinner. The resident engineers were A. W. Carr and the author. Carr left the job in order to accept appointment in Sacramento. The two mainstays for the contractor were Paul Shaw, Assistant Superintendent, and Ruth Wyndham, Project Office Manager. Both were on the job from beginning to end and assisted the state engineering personnel in every way possible. Their cooperation was greatly appreciated.

Plant-mix Surfacing

Among the various items of work, the plant mix surfacing was of particular interest. The contract special provisions stated that material of satisfactory quality for use in the production of mineral aggregate for plant mix surfacing could be obtained from within the highway right of way but

Completed construction of four-lane, limited access freeway on Santa Ana Canyon Road in Orange County

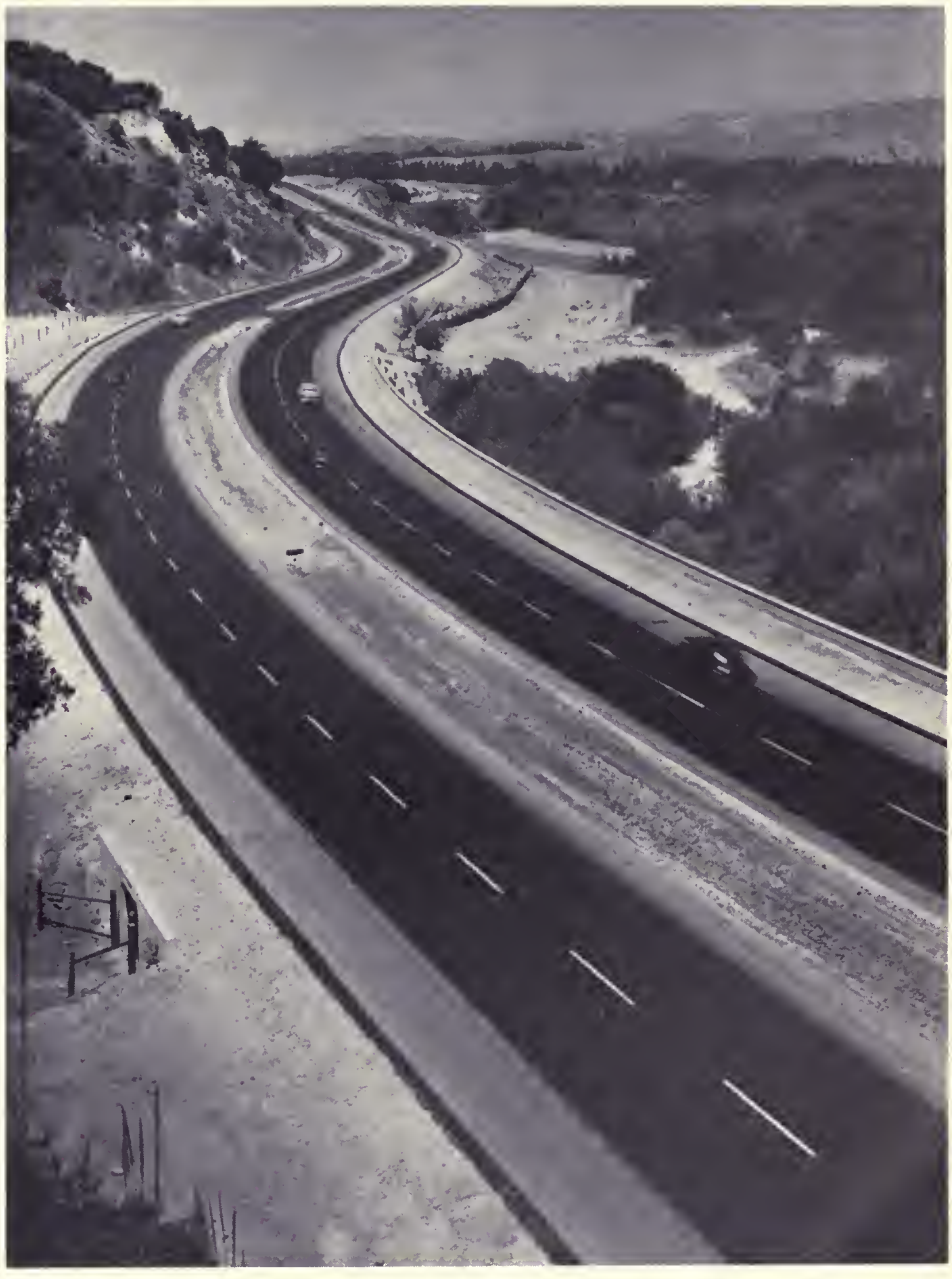


outside of the roadway prism, between Stations 461 and 476. The contractor elected to use this source of material for his mineral aggregate for plant mix surfacing as well as his mineral aggregate for cement treated base. His rock plant setup was stationary type and not portable type of equipment. From the beginning of operations, it was known from field tests that the contractor would have difficulty in getting this material to meet the grading requirements, particularly on the No. 200 sieve. After producing approximately 13,000 tons of plant mix surfacing and trying various means of meeting the grading requirements, it was agreed that the problem could not be licked by ordinary means.

Aggregate Problem

During the initial production period, the aggregate was either within the grading requirements on the 200 sieve and out on the 30, 8, 4, and sometimes the ⅜; or it was within the grading requirements on the ⅜ and 4 and was out on the 8, 30, and 200. There were just too many fines. The contractor tried blowing out the fines with fans and blowers, but the fines stuck to the larger size rocks. Various size screens were tried; wasting a portion of the material passing the ⅜-screen was tried; and blowing the excess fines out the stack of the dryer was tried; but nothing worked until the material was washed. This was accomplished by the installation of a spray bar and two pipe jets above the top deck of the vibrating screens, (all 2-inch diameter pipe) and so arranged as to create the greatest amount of washing possible to the material as the water was sprayed against it.

The source of water was the Santa Ana River, flowing nearby where a 40 h.p., 4-inch centrifugal pump was installed to provide a rated 650 gal./min. at 50 lb./sq. in. pressure. This water was supplied to the crusher in a 4-inch pipe with a 4-inch standpipe running from the ground up to the screens. The mixture of water and minus ⅜-inch material fell through the screens into a trough below where it was carried into a sand dehydrator of the single strand paddle type. The sand dehydrator fed the minus ⅜-inch material back into a bunker and allowed the water and suspended fines to be carried off in a flume back into the Santa Ana River.



This shows another section of the completed access freeway on Santa Ana Canyon Road

From the time of washing the mineral aggregate, no other serious difficulties were encountered. The contractor was able to keep the material within the grading requirements on all screen sizes, and satisfy all specification requirements.

The cost of this contract, which was 6.1 miles in length, amounted to $1,013,600 in contract items and additional work. Among the state personnel assigned to this contract were Pat Kennelly on roadway excavation, Bill Brady on structures, Frank Teeter on cement treated base, Roy Gardner on plant mix surfacing and Joe Truxaw on plant mix surfacing plant.

THE DANGERS OF NIGHT

Three times as many pedestrians are killed during hours of darkness even though there are fewer cars operating. When you're driving at night, be alert for pedestrians.

Quality Control

Program of Purchasing Division Is Outlined for Departments

By GLEN MORGAN, Specifications Analyst, Department of Finance, Purchasing Division

ALTHOUGH the Purchasing Division seldom makes print in this magazine, we have recently launched a program which we hope will eventually affect all state departments. This program is the culmination of over two years of constant effort on the part of Lawrence E. Hobart, State Purchasing Agent, to improve state purchases through a "quality control" system.

The Division of Highways has the greatest number of specifications of any of the departments by far. Most of these specifications deal with materials used directly in the construction and maintenance of our highways. Until the advent of Highways' Service and Supply Department, little thought was given to non-highway items. Thanks to Milton Harris and his able crew of Service and Supply Engineers, a great deal of progress has been made in the standardization of these non-highway items.

Over-All Policy

In planning a procedure of operation for this quality control program, it seemed logical to establish an over-all policy and guidance group composed of the directors of the various state departments or their selected representatives.

The first meeting of this group was called to order by James S. Dean, Director of Finance, July 9, 1952. Mr. Dean pointed out the need for such a standards program and the desirability of having the committee composed of top level management. A. Earl Washburn, Deputy Director of Finance, was elected as Chairman and Glen Morgan, Specifications Analyst, Purchasing Division, Executive Secretary. This group is known as the "State Purchases Standards Committee."

Clearing House

The primary purpose of this committee is to lend to the various subcommittees and working groups, a degree of official sanction. It is to serve as a clearing house for ideas and suggestions between departments and the Purchasing Division. Appointments to all committees are to be made by department heads or committee members in every instance.

Any committee member may initiate a study and appraisal of any item needing investigation. Those departments having similar problems will be requested to appoint an active member, qualified to serve on a working subcommittee. Standards recommendations will be put into effect on a trial basis and then expanded to full scale operation as experience indicates.

Some agencies claim that standardization will smother the individual and stifle his initiative. This is not so, for we must depend on information and ideas from within the organization to set the standard. The man who uses the equipment or material, knows what he wants and needs. It is the duty of the committee to translate this know-how to precise terms, formally called a specification.

Items peculiar to a single department and already adequately covered by specifications are of no particular concern to this program. Our primary aim is to standardize those items purchased most frequently and in large amounts. It will be necessary to develop but few standards from scratch. There are over 16,000 federal specifications and countless others used by purchasing agents throughout the Nation. The problem is to find a suitable, basic specification, which can be so altered to fit the needs of the agencies involved.

These committees we speak of must be democratic; they must be composed of a complete cross-section of those affected by the program. This insures a maximum number of viewpoints and objections—real or fancied—are dealt with openly. Most important of all, anyone having a chance to air his views and to champion his cause will be much more likely to abide by the resulting decisions. You have your say—you have a vote—you support the outcome.

The results of the many fine projects on which some of the departments are working, are to be incorporated into this program. There is no intent to swallow up any of the committees already in operation throughout the State.

A serious effort will be made to keep the operation of the committee and working subcommittees free of excessive rules and regulations. All action will have to be on a voluntary basis—each recommendation will have to stand on its own merits. No arbitrary decisions will be made. Each problem will be worked out to everyone's satisfaction before any final action is taken.

The departments which are the major users of paints have been asked to appoint members to serve on a "Protective Coatings Committee." This committee's project is to determine the types of protective coatings most commonly used and assign to these types of paints. acceptable specifications that will assure us of a proper, uniform quality. Each department, each locality, each vendor, has a need, a duty, some honest complaint. All of these must be welded into a specification which will be acceptable to all.

All agencies will be furnished with specifications and all necessary information for properly identifying the items on the requisition or estimate.

Let us think of this program, not as standardization but as "quality control." Quality control does not simply mean the best—it means the best quality for the intended use of the article purchased.

Briefly, this program is based on the democratic principle of everyone involved having a voice, a vote and a willingness to accept a decision. The degree of success at which we can operate will depend upon the wholehearted effort of each participant.

District IX

Highways in Inyo and Mono Counties Carry Heavy Tourist Traffic

By ALAN S. HART, District Engineer

U.S. Highway 395 from the San Bernardino County line northerly approximately 300 miles to the Nevada state line at Topaz Lake forms the very backbone of the network of state highways in District IX.

Together with an assist from U. S. Highway 6, it is the economic lifeline of an area which has no through railroad lines nor any scheduled airline flights. The highway also provides this great eastern empire with its commercial outlet. A branch line of the railroad does penetrate on broad gauge as far north as Long Pine and then sticks forth a tiny sliver of narrow gauge rails to Laws, north of Bishop; but the part it currently plays in the transportation of goods, products, raw materials and personnel is small compared to that of the fleets of motor trucks which daily rumble over the highways.

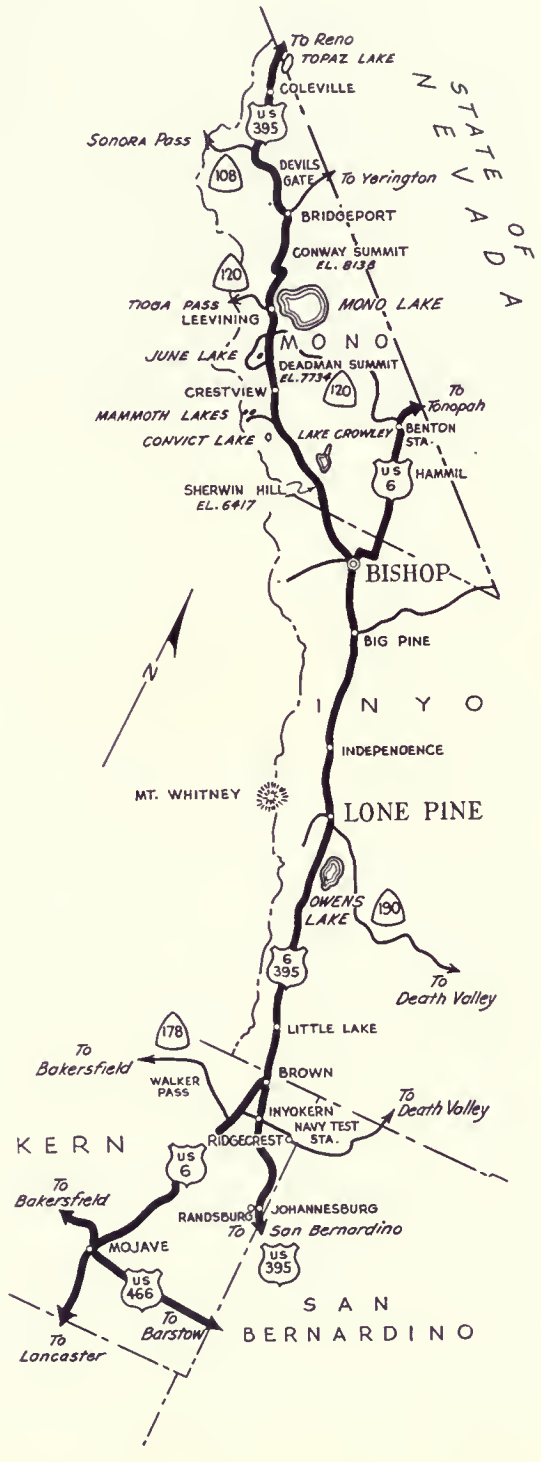
Mono County is entirely bereft of rail, air or sea transportation and depends entirely upon the highway for its daily bread and for its economic existence. Mining, lumbering and cattle raising, which once were the dominant economic factors in the well-being of this remote mountain country, are all now relegated to subordinate positions to that of the tourist industry. Catering to the desires and necessities of the tourists has now become the top-ranking industry in Mono County, and this has been made possible by reason of the highways not only in the county but in the approaches thereto.

Recreational Area

While Inyo County is not so dependent upon the tourist trade, it is still a major county industry, inasmuch as by far the largest percentage of the tourists are from the southland and must of necessity pass through Inyo County to reach the playgrounds of Mono.

Looking at the map, U. S. Highway 395 appears to be solidly supported on the south by two well-braced legs: U. S. Highway 395 extending toward San Bernardino and U. S. 6 extending toward Los Angeles. Together they accommodate the traffic from Southern California and speed travelers on their way northerly. U. S. Highway 395 in District IX starts at the mining town of Johannesburg, just north of the San Bernardino-Kern County line, and projects itself northerly through the rolling hills of the Mojave Desert. Just a mile north of Johannesburg is the historic and still active mining community of Randsburg.

This portion of U. S. 395 is State Highway Route 145 and has been progressively rebuilt since World War II to current highways standards on a two-lane basis. The most recent project was completed in late 1951 by E. C. Young of San Fernando. This project, costing





Convict Lake as seen from U. S. 395. The turnoff to the lake from U. S. 395 may be seen in the lower left foreground.

$75,000, was five miles long and closed two gaps between previous construction projects so that a continuous portion of Route 145 from the southerly boundary to the Ridgecrest turnoff, a distance of 15 miles, is now being traveled by the public.

Desert Highways

From the Ridgecrest turnoff northerly to the Junction of U. S. 395 and U. S. 6 at Brown the highway is typical improved desert highway but not modernized. Sharp dips, right-angle turns and inadequate pavement thicknesses characterize the next 20 miles as the highway passes through the town of Inyokern on its way to its junction with U. S. 6. Plans are in the making for the progressive modernization of this last remaining desert section of U. S. 395.

Inyokern is the gateway to the huge Naval Ordnance Test Station at China Lake some eight miles easterly. The growing town of Ridgecrest is just outside the gates of the test station and supplies the Navy with considerable housing, as well as merchandise and consumer services. Easterly of Ridgecrest lie West End, Argos, and Trona with their oversize potash and other chemical plants. Altogether, this area comprises the "metropolitan" area of District IX with some 20,000 to 25,000 people living in this region. A new county F. A. S. road leading northeasterly out of Trona now provides a different and shorter entrance into Death Valley via Wildrose Canyon for tourists from the south.

Improvement Under Way

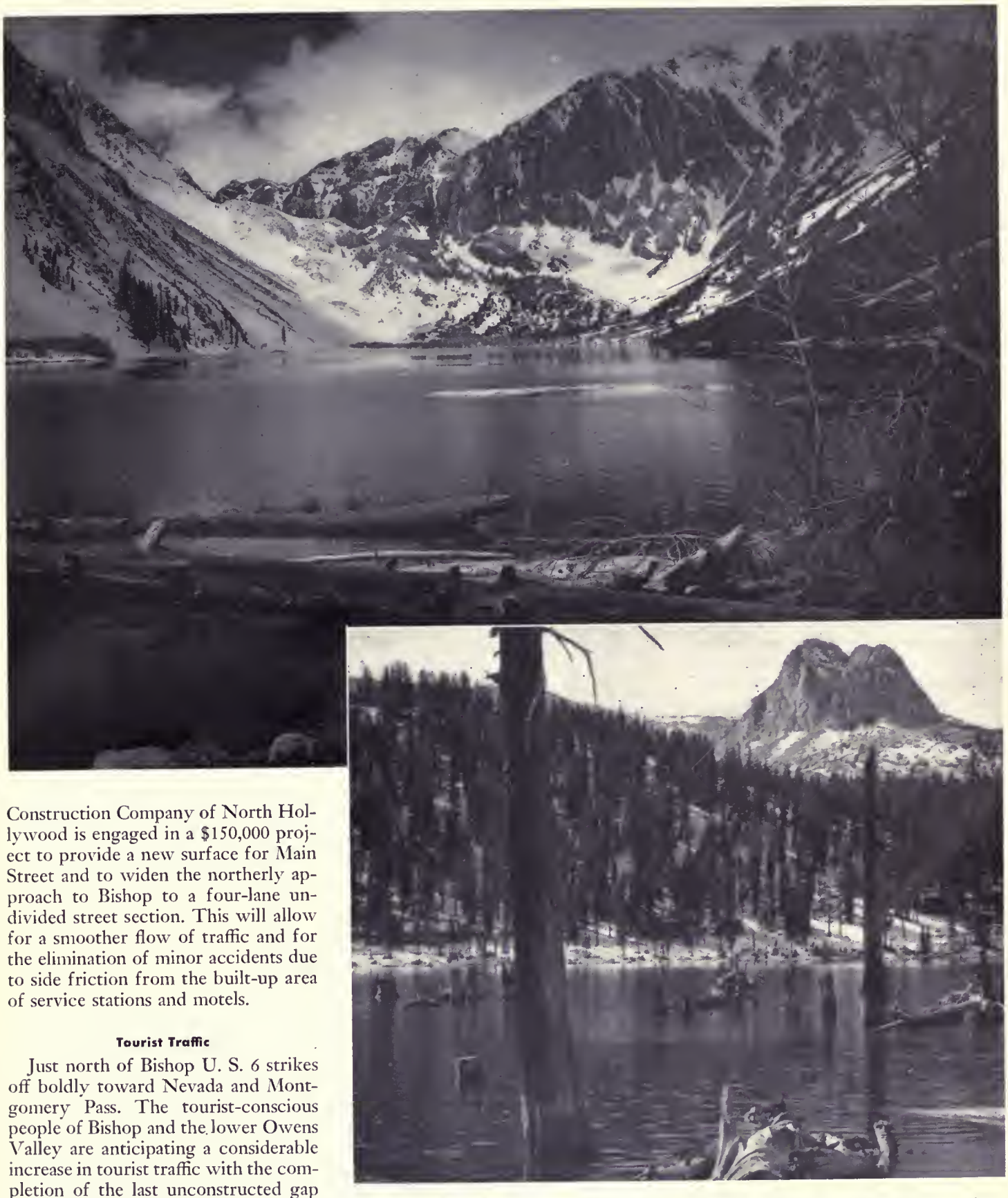
Near Brown in northern Kern County, U. S. 6 and U. S. 395 become one and jointly use the same roadbed northerly to Bishop. The settlement of Little Lake in Inyo County is located at the ridge which separates the Mojave Desert on the south from the Owens Valley on the north. Rice Brothers of Marysville currently are engaged in a $130,000 contract for regrading portions of the highway both north and south of Little Lake and for building improved road-mixed surfaced shoulders over a total distance of 17.6 miles. This project is unique in District IX in that it will provide the first section of four-lane divided highway in the district. This has come about not because the volume of traffic warrants, but because it was more economical to widen to four lanes than to deepen the cuts for sight distances.

U. S. 395 in the Owens River Valley enables the tourist to enjoy real awe-inspiring scenery along the east slope of the Sierra Nevada Mountains. These highest mountains in the United States are viewed in complete reality culminating in the view of Mt. Whitney at Lone Pine. Lone Pine is also the gateway to Death Valley to the east.

Deficiencies Exist

While U. S. 395 in the Owens Valley is of such a high standard that vehicle speeds of the highest order are easily and actually obtained, there are still deficiencies to overcome. The horizontal alignment of State Route 23 is almost without exception of the best but the vertical alignment leaves much to be desired. The current program on Route 23 is pointed toward the elimination of these vertical alignment restrictions and the providing of additional width of pavement by supplying oil-mixed shoulders. Only the fact that traffic is still relatively light, as major highway traffic goes, prevents more accidents than do occur. Speed, fatigue, and stray animals on the highway account for nearly all of the accidents within the district.

The heaviest concentration of traffic in District IX occurs within and just northerly of the City of Bishop. To alleviate this condition the G. W. Ellis



Construction Company of North Hollywood is engaged in a $150,000 project to provide a new surface for Main Street and to widen the northerly approach to Bishop to a four-lane undivided street section. This will allow for a smoother flow of traffic and for the elimination of minor accidents due to side friction from the built-up area of service stations and motels.

Tourist Traffic

Just north of Bishop U. S. 6 strikes off boldly toward Nevada and Montgomery Pass. The tourist-conscious people of Bishop and the lower Owens Valley are anticipating a considerable increase in tourist traffic with the completion of the last unconstructed gap of U. S. 6 in southern Utah.

. . . Continued on page 58

UPPER—Close up view of Convict Lake in Mona County. LOWER—Lake Mory in Mono County, popular recreationol spot reached by U. S. 395.

Idea Pays Off

House Condemned on Freeway Is Made Into Beautiful Home

Mrs. Joan H. Woodbury, a woman nearly 80 years of age, gazed critically at a bungalow which was condemned to be sold and moved from where it stood, to make room for the Hollywood Freeway, being constructed to insure safer and speedier motor travel in Los Angeles.

Mrs. Woodbury had recently returned from a Central and South American tour to discover, with housing shortages, how difficult it was to find the type of building she desired. For years she had owned and managed large hotels and apartment houses, in fact had, before her latest sight-seeing jaunt sold herself out of a home, by disposing of two apartment houses.

And now, she longed for a small home. One she could artistically furnish with household goods which would perfectly fit into a Cape Code cottage. She examined critically the construction and design, both inside and out, of the building before her. Although old, it had been built by excellent craftsmen. She readily imagined what this small cottage could be made to look like with the touches she would add to improve it's appearance.

Moves House 15 Miles

She wrote a check as a deposit and received in writing an allowance of three weeks for removal. The next day she scanned the newspapers for a lot. She wanted to live near the ocean. Being a native San Franciscan, she craved sea air with a bit of fog thrown in. As her daughter, Joan Woodbury —wife of Henry Wilcoxon, movie director and producer—with her three small daughters, lived in Brentwood, Mrs. Woodbury sought a lot so as to have residence near to them, as well as the sea breezes and fog. This she achieved in buying a lot in Mar Vista, high above sea-level.

Fortunately, she found a house mover who agreed to move the building 15 miles and set it down on it's new foundation without a crack in the plaster. After buying the lot Mrs. Woodbury was requested to make a drawing of what she intended to make the building look like, for the building inspectors, so as to receive a permit to construct. She fulfilled all demands, adding a colored drawing of the finished product.

Garage to Match House

As there was no garage with the bungalow, this meant a search for one to match the house. It was accomplished and a double garage was moved to the end of the lot with it's door facing the alley. To make the garage further match the house, shutters and window boxes planted with coral and white flowers were added. It now looks like a small bungalow.

The house contains two bedrooms with color scheme, one in Delph blue, the other in ashes of roses. Furniture is Italian hand decorated, blending well with the color scheme. The living room is 14 by 28 feet with windows looking out at window boxes. The walls of the room are done in a soft tan which lends itself as a fitting background to the fine collection of original oils—water colors and pastels collected by Mrs. Woodbury and her ancestors. Mrs. Woodbury had the light hardwood floors sanded and stained dark. They look like mahogany and their

UPPER—House after being moved 15 miles and located on Mrs. Woodbury's lot. LOWER—View of house one year later after redecorating had been done and landscaping started.





Fish pond in center of Mrs. Woodbury's garden near the back of her garage

polish is so bright that the hand-carved furniture and antiques standing above are reflected in the rich surface.

Attractive Patio

Through French doors one descends into an attractive patio. Here the walls are adorned with Indian baskets and curios gathered during Mrs. Woodbury's many travels. There is patio furniture and a grill, and a broad table covered with a hand-woven table cloth made by Guatemalan Indians. Here Mrs. Woodbury entertains with teas, luncheons, and Sunday morning breakfasts. While dining, her guests are made happy with the enchanting view of the beautiful back garden, enhanced with a goldfish pond with pond lilies in bloom, garden seats, a Madonna shrine, fruit trees and the colorful garage in the background.

EDWIN B. NORMINGTON

Continued from page 27 . . .

In 1918, Mr. Normington left the Pacific Gas and Electric Company to enter the service of the Western Pacific Railroad Company at Sacramento, as electrician and armature winder, remaining with them until shortly before the nation-wide railroad strike in 1922, when he joined the then newly formed Equipment Department of the Division of Highways.

The years Ed Spent in carriage-building and wood-working in earlier years have made it possible for him to enjoy many pleasant hours and to derive much satisfaction from his rather complete workshop in his Sacramento home.

Mr. Normington's retirement date almost coincides with that of the 43d anniversary (August 4, 1952) of his marriage to Theresa Belle (Schwartz) Normington. They have two married daughters, Reba Tugaeff and Desirée Flynn, a son, Elmer Normington, and seven grandchildren—a continual source of pride for Ed and Mrs. Normington—all of whom reside in the Sacramento area.

Mr. and Mrs. Normington plan to spend their retirement on their pine-tree studded 14-acre farm on Pleasant Valley Road, four miles east of Diamond Springs, near Placerville.

Ed is well-known in highway circles throughout California and over the years has made a host of friends who wish him and Mrs. Normington a long and happy retirement.

Wanton Damage

Continued from page 18 . . .

mill west of Red Bluff and transferred their load. Logs that were to be cut into lumber stayed at the mill. But all logs that were to be used for plywood were reloaded and hauled to the plywood mill at Anderson, I think he said. In this way they can check their loads that are going to be hauled on U. S. 99 and stay within the limit. But up to the point of transfer they seem to be overloading to their heart's content.

As we were driving through Grizzly Creek Redwood Park we came to a place where the Van Duzen River has cut away the bank until something is going to have to be done to save our highway. There are two large redwood trees that should be removed. If we can remove those two trees the Division of Highways can save about $50,000. If the trees cannot be removed we are going to have to spend that sum for a log or concrete crib to hold the river from cutting any farther into the road. If we can remove them we can move the road into the bank 10 or 20 feet and have a safer and better road.

The conclusion I reached, after this trip, is that our Legislature should be made aware of what is happening to our highways due to excessive loads, and some method arrived at to curtail the excessive overloads that are being hauled over highways that were not built to stand them.

Bad weather doesn't stop these log haulers. Even if the road becomes almost impassable to an ordinary car they still continue to haul over it, and that only makes the road more difficult to keep in shape or repair.

SKID DANGER

Whenever possible, avoid use of brakes when making a turn or taking a curve. Your car is more apt to go into a skid when you apply the brakes on a turn or curve than when you use them on a straight stretch of road.

CROSS AT CORNERS

One out of every three pedestrian deaths last year was caused by jaywalking. Safety is only as far as the next corner. Play it safe; use the crosswalks.

Early Days

Minutes of First Highway Commission In 1912 Make Interesting Reading

By R. C. (CASS) KENNEDY, Secretary, California Highway Commission

(Continued from last issue)

THERE IS one paragraph in the rules that I would like to read into this article. Paragraph 3 of the general rules stated that every letter in reply to another "shall cite the date of the letter replied to and, in addition, shall contain a sufficient repetition of the subject matter of such letter as to permit of a complete understanding of the subject of the correspondence should the incoming letter become lost or misplaced."

I am wondering how many readers have ever received a letter from the Director of Public Works or the Division of Highways. If they will remember, nearly every letter starts out "Reference is made to your letter of (a certain date) regarding (so and so)" and the content of the letter addressed here is then stated.

This idea that was promulgated on January 22, 1912, is still in effect. I would like to cite other rules and regulations, made years ago, which still stand. When a file becomes thick, and it is a chore to delve through it to find out what it is all about, if, in the first, or topmost, letter you can find a resume of the content, it makes it much easier for everybody concerned.

Filing of Correspondence

In these same rules it was designated that "one person in each office shall be designated a file clerk and that no other person shall be permitted to place or to restore correspondence to the files." As time goes on the files grow, and grow, and grow. At the present time the files of the Division of Highways and of the Director of Public Works are quite large. In the case of the Division of Highways there is a separate section devoted to files, in which there are a number of people employed. These people are the only ones authorized to place or take anything from the files. The same thing holds true for the office of the Director of Public Works. In 1912 they made a rule that one person only should be responsible for the files.



Old Altamant Pass in Alameda County before it was impraved by gas tax funds

And here again, in this same lot of rules, is the designation set up regarding how to identify different routes. I think the same idea is still in existence.

On this same day, January 22, 1912, the commission adopted a list of approved abbreviations for the different counties, and I am almost certain that this same list of abbreviations is still in use all over the Division of Highways.

Jobs Filled

Further business that afternoon consisted of voting jobs for a number of people. There was no civil service in that day, and everybody who wanted a position with the commission or with the Highway Department applied to the Highway Engineer and he recommended to the commission that they be employed. Every person so employed was voted into office or into the position by the commission, and their salary was stated in the vote. There are about three or four pages of votes taking people into the system, and usually they are starting on February 1, 1912. It would seem that the commission, by this time, had decided that February 1st was going to see the start of the California Highway Commission and the Highway Department.

On the morning of January 23, 1912, the commission met in regular session and approved some claims for expenditures, and then recessed to meet with Governor Johnson and the advisory board. The minutes of what transpired with the advisory board are not in the minutes of the California Highway Commission, so there is no way of finding out what transpired there. But that afternoon the commission reconvened and Mr. Blaney read a preamble and resolution which had been passed by the advisory board that morning, which had approved their expenditures and gave the Highway Commission further powers for signing papers legally and also gave it power to conduct its business as it saw fit. Six more people were voted jobs that afternoon.

Delegations Received

On January 24, 1912, the commission met at 9 a.m. It had promised to hear a number of delegations. There is a record that each half hour, even up to 12.10 p.m., the commissioners listened to different delegations. They evidently recessed for lunch, although there is no statement in the minutes that this had been done, but the minutes show that they were still listening to different groups at 4 p.m. that afternoon. That afternoon they also voted 21 more people positions with the highway department.

Also, on January 24, the first signs of expansion appear, for on that day the highway engineer was authorized to negotiate with the owners of the Forum Building for a room, or rooms, on the sixth floor of that building, to be used for a road material testing laboratory and for photographic purposes. This, of course, in addition to the office spaces the commissioners already had made the necessary arrangements for.

Route Numbers Approved

On January 25th the commission met at 10 a.m., and received several different delegations from different spots of California regarding roads. It also voted, tentatively, route numbers for certain different roads. There were nine of them, and there is no use numbering them or telling where they happened to be at that time. The commissioners specified that the sections of the several routes be each, as nearly as they may be, 20 miles long, and that no contract or estimate include work in more than one county. They were evidently looking far ahead so that estimates would not straddle over into another division. They also, on this date, authorized the highway engineer to cause to be made surveys, plans, and estimates for several roads. At least one road was in every division, so that this would mean that every division office was now ready and willing to go and was evidently equipped both as to office space and personnel and the necessary surveying instruments, desks, etc., to operate. They also voted that they buy four different automobiles—one for San Luis Obispo, one for Fresno, one for Los Angeles, and one for San Francisco. These were evidently for the use of the division engineers at these division offices.



State highway in San Benito County, typical of early highways made possible by first bond issue

Office of File Clerk

On January 26th the commission did not meet until 1.30 p.m., but all members being present, it proceeded to hear delegations from San Joaquin County regarding roads in that district.

It also established the office of file clerk at headquarters, and the file clerk was to have charge of all of the headquarters correspondence, including the opening and distribution of the mail, the copying of outgoing letters, the sealing and mailing of letters, and the custody of the postage stamps. All letters were to be marked by him for filing, and he was to be held responsible for the filing thereof. No letters or other papers were to be placed in the files except by the file clerk, and all persons who took papers from the files were to give a proper receipt to him therefor.

George G. Davis, who was then employed as a clerk, was designated as a file clerk at headquarters with a salary of $60 per month.

It was also voted that thereafter all official outgoing letters and telegrams from headquarters shall be written with copying ribbons and copied by the wet process. I am wondering how many of my readers remember what the wet process was of copying a letter. The writer remembers in his younger days when he had a position as office boy that he was responsible for the copying of all outgoing letters. In those days a real copy book was made, and used, by different corporations and companies. The books were bound and contained probably 100 tissue sheets, all numbered. You had a water bucket, or tank, full of linen cloths which were always wet. You placed a piece of cardboard back of the tissue sheet, placed one of these sheets of wet linen on it, pulled over a tissue on top of that, and placed your letter face down on it, put on this another piece of cardboard, and then put it in a press and squeezed the press down. After a certain time you released the press and took out a wet letter and put the linen piece back into the tank, and placed blotters on each side of the wet tissue in the book. And this was your record of your outgoing correspondence and was the way of keeping a copy of your outgoing letters. Certain organizations used individual pieces of tissue, so that they could be placed in a file along with the rest of the correspondence.

I wonder how far our Division of Highways would get today if it still had to use the wet process for copying all of its outgoing letters. It was rather a messy job.

Accounting System Set Up

On this same January 26, 1912, the commission voted that Room D, at its headquarters, be assigned to the secretary of the commission for his offices, and that Room C be assigned to the secretary's stenographers and the file clerk, and that Rooms A and B be assigned to the chief accountant and his subordinates.

The commission had made arrangements to have a conference with Klink, Bean & Company of San Francisco, called, in those days, expert accountants. So it recessed to meet again at 8.30 that evening with Messrs. Klink and Bean regarding the organization of an accounting system for the commission. It was voted that Messrs. Klink, Bean & Company be engaged by the commission to work with the highway engineer and the commission in installing a proper business system and method of accounts. The charge from Klink and Bean being $250 per week for principal's work and $150 per week for principal assistants. It was judged that two or three weeks would be necessary to install the first system, with additional work later as needed. Messrs. Klink and Bean were authorized to proceed at once with the preparation of a report to be taken up with the highway engineer on February 6th and then be submitted to the commission not later than February 8th.

Cortelyou Employed

In checking back over some of the things I might have missed I discovered that on January 23, 1912, it was voted that a man by the name of Spencer V. Cortelyou, who resided in Los Angeles, be appointed and employed as the chief assistant attached to Division VII, his term of service to begin on February 21st and to continue subject to the pleasure of the commission. His salary was to be $175 per month. For the benefit of the readers, Spencer Cortelyou retired on October 1, 1949, as Assistant State Highway Engineer in charge of District VII which includes metropolitan Los Angeles. A great deal of our highways and our freeways in Los Angeles County resulted from the employment of this man. Mr. Cortelyou is the one who laid out the original system of freeways and had a great deal to do with the initial construction of them.



Spencer V. Cortelyou, who entered service with the first California Highway Commission in 1912

On the afternoon of February 8, 1912, the commission met and received a verbal report from Mr. Bean of the firm of Klink & Bean, relative to the organization of an accounting system for the commission. He was given further time in which to prepare a written detailed statement of the plan offered, so that the commission could further consider the idea.

The rest of the meeting on February 8th was devoted to voting different men into different positions. Late that afternoon, a recess was declared until 10 a.m. the following day, when the commission met at 10 a.m., and voted that the highway engineer cause a reconnaissance to be made of the portion of Route 3 in Division II, between Redding and Dunsmuir. The highway engineer was instructed to cause a survey to be made of the portion of Route 4 in Division III between the southerly boundary of San Joaquin County near Ripon and extending in a southerly and easterly direction through Modesto to the southerly boundary line of Stanislaus County.

Miss Murray Appointed

A number of communications recommending various proposed highway routes were read and filed. That afternoon the commission voted that its attorney be directed to prepare forms of bonds to be executed and filed by the division engineers, and at the same time it voted that Miss Myrtle Murray be appointed to the position of stenographer, to begin on February 13th. Miss Murray later served as administrative assistant to several public works directors and for two days under Governor Rolph was Director of Public Works, an honorary appointment.

It would seem that the expansion program was taking up more time than the two previous stenographers could handle, so that it was necessary to expand the headquarters office of the commission so that work could be done. On February 19th the commission met at 2 o'clock and voted two or three people into jobs, and then recessed until 8 o'clock in the evening.

At that time the attorney, C. C. Carleton, was instructed to prepare and forward a letter to the various boards of supervisors of the counties of California in form and substance as directed. In this letter it was stated that a number of counties, through their representatives, had offered to provide free rights of way and to build all bridges necessary for such state highway, or highways, as may be located within their respective limits. It was beginning to be evident that the bond issue of $18,000,000 was going to be inadequate for the great work projected, and the commission believed that each county which might be benefited by the routing of the State Highway System through its territory should be ready to do its part in making the state highway undertaking an unqualified success. The commission asked that the boards of supervisors consider this important matter at once, and trusted that they would adopt a resolution agreeing to furnish free rights of way and to build necessary bridges for such state highways as might be located in their counties.



Fred W. Haselwood, deceased, who became a principal assistant highway engineer in 1912

Haselwood Employed

On this date, also, it was voted that Fred W. Haselwood should be employed as a principal assistant engineer in Division I at a salary of $175 per month. Mr. Haselwood retired from state office on May 31, 1950, as district engineer and passed away shortly after that. The rest of the day, or rather the evening, was taken up with voting a number of people into positions.

New Automobiles

One of the things that was done on February 19th was to order three 1912, Model G, Franklin touring cars, fully equipped with top, glass front, trunk rack, Stewart speedometer, side tire carrier, and one set of Weed tire chains, for $2,500 in cash, and a 1912 48-h.p. seven-passenger Locomobile, now in their service, in trade. One of these new Franklins was to go to Sacramento, one to Redding, and one to Willits. The last paragraph states:

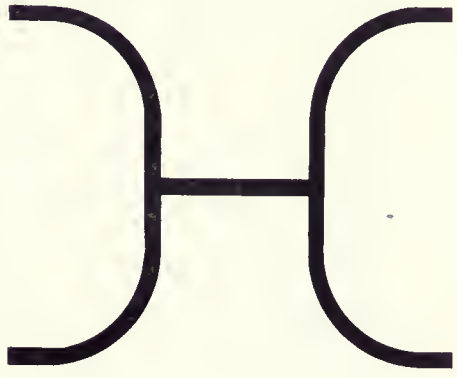
"In addition, you will agree to furnish for the purpose of instruction, a man with each of these cars for a period of two, and not to exceed four or five, days."

By this time you probably realize that this Highway Commission was meeting every day. It would seem that this was a full-time job in 1911 and 1912.

Stock Brand Designed

On February 20th the commission met again at 10 a.m., and passed Schedules 17, 18, 19, 20, and 21. These appear to be warrants for paying the salaries and for various supplies of all kinds.

At 4 o'clock that afternoon the session was resumed and on the recommendation of the Highway Engineer, a brand was authorized for use on stock used by the State and under the control of the commission, and the Highway Engineer was instructed to cause every animal so owned to be properly marked on the left hindquarter with said brand. The brand was composed of a letter "C" drawn backwards and a letter "C" drawn the correct way with a short space between them connected with a bar, leaving the brand to be "Ↄ-C."





UPPER—This brand was adopted by the first California Highway Commission for use on livestock owned by the highway department. LOWER—Today the old brand is no longer used and this emblem is emblazoned on all motor vehicles owned by the Division of Highways.

Chairman Towne reported that the commission had met in session with the Advisory Board in the Governor's Office and that the board had ratified everything the commission had done.

Surveys Authorized

On February 21st the commissioners met at 10 a.m. and listened to six different groups presenting their ideas of where highways should go through different counties and different cities. They recessed at 4.30 p.m. to meet again the next morning. February 22d, in my memory, is Washington's Birthday, but this seems to have made little, or no, difference to the Highway Commissioners in 1912. They met on Washington's Birthday and listened to people from other portions of the State regarding roads and finally recessed about 12 o'clock to pick up again at 1.30 p.m.

At 1.30 p.m. they listened to more groups talking about their trials and tribulations and where their roads should go.

Also, on Washington's Birthday of the year 1912, the Highway Engineer was authorized to make surveys and plans and estimates on a route in Division III on a main road beginning at the southerly boundary of Tehama County below Vina and extending in a general southeasterly direction through Chico, Yuba City to Marysville; also, the main road beginning at the southerly boundary of Tehama County near Orland and extending southerly and southeasterly through Willows and Williams to Woodland. Division V was ordered to run a reconnaissance of a line from King City Bridge passing through Jolon and Pleyto to San Miguel.

The commission also approved the bond of Mr. Carruthers as Division Engineer of the Fifth Division.

Tom Stanton on Road

On February 23d the commission adjourned and didn't meet again, according to the minutes, until March 18, 1912. On that date it met at 2 p.m. and listened to Mr. Bean of the accounting firm of Klink & Bean. He talked relative to the organization of the accounting department. The bond of Mr. Woodson, the Division Engineer of Division VI, was approved,

and the secretary was asked to take up with the Governor's Office the necessity of the appointment of Miss Murray as a notary public in and for Sacramento County, with offices to be with headquarters of the commission.

The balance of the day was used up in voting a number of people into jobs—a total of 65 if I have counted correctly. And among those voted in on that date, to start work on April 1, 1912, was Thomas E. Stanton, Jr., who was appointed as principal assistant engineer in Division VI. Mr. Stanton retired on May 1, 1951, after 39 years with the State Highway Department.

On March 19th the commissioners attended to routine matters and adjourned to meet with the Advisory Board of the Engineering Department in the Governor's Office at 2 o'clock that afternoon.

On March 20th, the commissioners heard residents of San Joaquin County and Santa Barbara County, who appeared and advocated certain proposed highway routes.

Chairman Towne reported that the advisory board, at its meeting of the preceding day, had passed on all of the work that had been done and had approved the minutes. He further reported that at the conference a general discussion was held at the request of the Governor, regarding the relation of the Board of Control to the work of the California Highway Commission, ensued. It seems that the discussion ended up in a stalemate.

And that same afternoon the commission listed a number of banks—at least one bank in each division—which would be depositories for any money received by the commission in those different divisions. On March 21st, a delegation from the Tulare Board of Trade was heard.

Late that afternoon, Thomas H. Dennis, who at that time resided in Roseburg, Oregon, was appointed and employed as an instrument man attached to Division V, to start work on April 1st and to get $100 a month. Tom Dennis retired as Maintenance Engineer on October 1, 1949, after 37 years in the Highway Department. On that same day Spencer W. Lowden, who resided at Redding, was appointed as a rodman attached to Division II, to start work on April 1, 1912, at a salary of $70 a month. "Spence" Lowden is now our District Engineer in District VIII at San Bernardino.

(To Be Continued)



Thomas E. Stanton, Jr., started his highway career in 1912



Thomas H. Dennis, who retired as maintenance engineer in 1949 after 37 years in the highway department

New Eastshore Freeway Unit Open to Traffic

With a caravan of over 100 automobiles, the City of San Leandro and San Lorenzo Village on Friday, June 13th, helped dedicate a new section of the Eastshore Freeway. The newly opened section, costing $3,531,212, is 4.2 miles long and extends from the 98th Avenue separation structure in Oakland to Lewelling Boulevard in San Lorenzo.

Friday, June 13th, is supposed to be an omen of bad luck but the residents of these well-populated districts of Alameda County count it a mighty lucky day. For this day opened a bottleneck that had been bothering them for a number of years.

Cost $3,500,000

Costing something over three and one-half million dollars, the new freeway takes care of a vast number of industrial plants which have settled in the section besides hundreds of commuters. According to the people of San Lorenzo Village, the new freeway will put Oakland within 20 minutes of their homes. Before the completion of this section they have said that the time to get to Oakland varied anywhere from 45 minutes to an hour.

Everybody connected with the parade met an hour before the starting time in a get acquainted gathering and proceeded to just south of the 98th Avenue separation structure. Here a symbolic golden chain was across the highway. With gas and a cutting torch, Ridgeway Gillis, Deputy State Highway Engineer, severed the chain.

The caravan then proceeded to near Lewelling Boulevard where a purple ribbon stopped the crowd. Here, again, Gillis was called upon to do the honors, flanked by John H. Skeggs, former Assistant State Highway Engineer, now retired; David Bohannan, developer of San Lorenzo Village and George Janssen, Supervisor of Alameda County.



UPPER—Deputy State Highway Engineer Ridgeway Gillis severs ribbon near Lewelling Boulevard. LEFT TO RIGHT—Col. Jno. H. Skeggs, former assistant state highway engineer; David Bohannan, developer of San Lorenzo Village, and Alameda County Supervisor George Janssen. LOWER—Deputy State Highway Engineer Gillis severs chain near 98th Avenue separation structure. LEFT TO RIGHT—Miss Marjorie Junet, queen of the San Lorenzo festival; Gillis; Charles Grant, Air Reduction Company; Hal Saunders, Pacific Coast Manager of Air Reduction Company.



Eastshore Freeway, looking north, showing Washington Avenue interchange. Recent housing development shown in left background. Underpass in foreground is future on-ramp from State Route 228. Frontage road in foreground provides for access to future residential area.



Eastshare Freeway, shawing Davis Street interchange in San Leandra, and shawing fully develaped interchange. Dadge assembly plant and parking area shawn in left backgraund.

State Fair

Highways Will Carry Thousands To Big Show in Sacramento

California families by the thousands will take to the State's splendid highways and head for the State Fair in Sacramento, August 28th through September 7th, to view the spectacular representation of the State's history and future, its natural resources, its progress and people.

Official theme of the 1952 event is "The Family" and fittingly, the fair will offer a variety of attractions in both educational and entertainment categories that will offer appeal to young and old. Like California's economy itself, the State Fair is many-sided and seeks to present an over-all picture of the Golden State.

Parking Areas

Centering on Sacramento from the network of California highways and roads will be not only scores of thousands of visitors traveling by automobile, but the vast amount of shipments of livestock, machinery, equipment, supplies and many exhibits that will be seen during the 11-day run of the fair. All possible will be done to accommodate the visitors who arrive at the fair by motor vehicle (there were an estimated 160,000 of them in 1951). Some 40 acres of public parking areas, well-supervised and patroled, will be provided within or adjacent to the fairgrounds. The trailer lot on the grounds is being nearly doubled in capacity and utility service is being improved for families who reside in their mobile homes while attending the State Fair.

From every standpoint, the 1952 State Fair promises to be the biggest and best ever. Exhibits will total into the thousands and more than 40 free entertainment events are scheduled. An extensive program of building and grounds improvements has been carried out and the State Fair adheres to its long established admission scale even though the program has grown vastly. Gate admission is 50 cents with children under 12 admitted free.

The admission price permits the visitor to see most of the State Fair free. There are three extra-admission events . . . the horse show, night theatrical spectacles and horse races.

Many Attractions

Products of the soil and agriculture in general naturally are a basic part of the State Fair. The livestock shows, including both open and junior divisions, are the largest in California. The program includes separate, five-day shows by Future Farmers of America and 4-H Clubs. A total of $118,000 in premiums are offered for livestock . . . $75,000 in the open division and $43,000 in the junior classes.

There will be hundreds of entries and keen competition in the poultry, pigeon and rabbit department, while the finest output of a vast California industry will be exhibited in the dairy products department. The huge Counties Building will be a teeming center of the entire State Fair. Some 40 counties will exhibit products from within their own boundaries . . . products of agriculture, floriculture, horticulture, minerals, lumber, textiles, bees and honey and wines. Several foreign nations will have booths on the mezzanine of the Counties Building.

Art Exhibit

The art exhibit, California's largest and one nationally known, will show the best works of living California artists and include divisions for crafts and for entries of art students. Prints from many parts of the world will be shown in the photographic salon.

The California Fashion and Fabric Exposition and its companion Pageant of California Fashions again will be a highlight of the State Fair. The pageant will be staged nightly at the open air theater, with professional models showing winning entries of California manufactured apparel.

The list of special events is a long one, and affords virtually continuous entertainment, including band concerts, square dance groups, drill teams, puppet shows, variety acts, a drill by sheriff's posses and many others. Two nationally broadcast radio shows will go on the air coast-to-coast directly from the fairgrounds, September 1st through 5th. They are Lucky-U Ranch and Big Jon and Sparky, both programs of the American Broadcasting Company. Broadcast times are from 12.30 to 1 for Lucky-U Ranch and from 2 to 2.30 p.m. for Big Jon and Sparky.

A feature of the free shows will be a mock amphibious attack on an island of the race track infield the afternoon of September 7th. Demolition squads, "frog men," tanks and flame throwers will take part.

Rafael Mendez, world's greatest trumpeter, is returning by popular request to play twice daily at the bandstand. John Molinari, noted accordionist, is another headliner in the free entertainment program.

A star of the night theatrical spectacles will be Xavier Cugat and his orchestra, with outstanding supporting acts. Fireworks will be presented nightly, and the gayway of carnival and many other attractions will be open daily from 10 a.m. to midnight.

All exhibit buildings will be open daily from 10 a.m. to 10 p.m.

WASHO ELECTS NEW OFFICERS

Mark U. Watrous, chief engineer of the Colorado Department of Highways, has been elected president of the Western Association of State Highway Officials. He succeeds W. A. Bugge, Washington State Highway Director.

Other officers elected during the association's annual conference in Seattle June 5th-7th included:

Vice president, E. V. Miller, Idaho highway engineer, and secretary-treasurer, W. E. Willey, engineer, division of economics and statistics, Arizona Highway Department.

Members elected to the executive committee are Bugge, D. C. Greer, Texas highway engineer, and W. C. Williams, Oregon assistant highway engineer.



Thousands of visitors to the State Fair in Sacramento this year will motor to the attraction over state highways. Some may even come in autos of this vintage.

Successful Tour

Highway Commissioners Inspect Projects in San Joaquin Valley

By CHESTER H. WARLOW, Highway Commissioner

FIVE DAYS away from our offices, over 700 miles of travel through Highway Districts VI and X in the San Joaquin Valley, 18 stops for informal meetings with local officials and community representatives, and a pleasant and comfortable trip, sums up the latest inspection tour of the California Highway Commission.

After two and one-half days of formal sessions at Sacramento as our regular June meeting, the entire commission, with the exception of Commissioner Walter Sandelin, left on the afternoon of June 12th for Merced, our first overnight stop. Mr. George T. McCoy, the State Highway Engineer, several members of his headquarters staff, and engineers from the two districts completed the official party.

Major informal meetings were held at Merced on June 12th, at Madera, Hanford, Porterville, and Lindsay on June 13th, at Tulare, Visalia, and Woodlake on the 14th, at General Grant Grove and Cedar Grove in Kings Canyon National Park on Sunday, and at Fresno and Bakersfield on June 16th. Many minor stops were made along the way, and at the major meeting places many near-by communities were represented and made presentations of their highway problems.

Purposes of Trip

The purpose of the trip was multifold: (1) To see what had been accomplished in the way of highway construction and betterments since the commission, as now constituted, took office in September, 1943, under the reorganizing statutes of that year. (2) To observe major projects now under construction in Districts X and VI. (3) To inspect the unbudgeted critical highway deficiencies, and high accident points in the territory.

A further, and highly important, purpose was to give the local officials, and the other community representatives, an opportunity to discuss with us informally and at leisure, their highway matters and to give us, the members of the Highway Commission, an opportunity to tell them of the problems of the State Division of Highways, and the conditions of our State Highway System.



CHESTER H. WARLOW

At these meetings, in addition to giving our attention to highway needs, we tried to make it clear that it is not within the province of the Highway Commission to advocate additional taxes for highway purposes, nor were we so doing. What we tried to do was to give the people of the San Joaquin Valley the truth regarding our stewardship over the nine years of our office tenure.

Millions Allocated

We told them that, during the nine years, we had allotted over six hundred million dollars for rights of way and construction. We told them that we had approximately one hundred million dollars per year available for rights of way, construction engineering, and construction.

We pointed out that in 1946 we had some one billion six hundred thousand dollars of highway deficiencies and that today we have over three billion dollars in deficiencies. We pointed out that the increase in the deficiencies is partly due to the higher costs of construction but that it is mostly due to the increased number of motor vehicles now using our highways.

We told them that the State is losing ground in relation to current overall highway needs. We also told them that this problem is theirs, and theirs alone. We suggested that if they wished this highway deficiency corrected it was their duty and that of their legislative representatives.

State-wide Picture

In the interest of clarity we cut down the state-wide picture to the local county levels of what had been spent under the provisions of the Collier-Burns Act of 1947, what was left to be done locally, and how long under present financing it would take to do necessary jobs. Upon this basis we then requested the communities to be patient with us, the California Highway Commission, and to understand why all their requests for construction work could not be immediately complied with, because what was happening in their areas in relation to traffic increases, accidents, travel inconveniences and hazards, was being duplicated in every part of our State.

We also impressed upon them that the primary function of the commission was to allocate the available funds in the manner required by our present statutes, and on projects in sequence of their prime necessity with fairness to all parts of the State.

We explained that the responsibility of the State Highway Engineer, among other things, is to construct projects to present and immediately impending

. . . Continued on page 64



UPPER, LEFT—Commissioners view Tulare bypass. UPPER, RIGHT—Ford Chatters and A. L. Evans, publishers of the Lindsay Gazette pose with Commissioner James A. Guthrie. CENTER—Highway Commission and group at Madera. LOWER, LEFT—Touring party stops at Fresno. LEFT TO RIGHT—Commissioner Warlow, Mayor Gordon Dunn of Fresno, Commissioners Horrison R. Baker, Charles T. Leigh, and H. Stephen Chase; Director of Public Works Frank B. Durkee, chairman of the commission; District Engineer E. T. Scott, Fresno; Melville E. Wilson, President of the Fresno Chamber of Commerce; Commissioner Guthrie and State Highway Engineer George T. McCoy. LOWER, RIGHT—Director of Public Works Durkee addressing group at Bakersfield.

Cost Index

Shows Little Change in Highway Costs During Second Quarter 1952

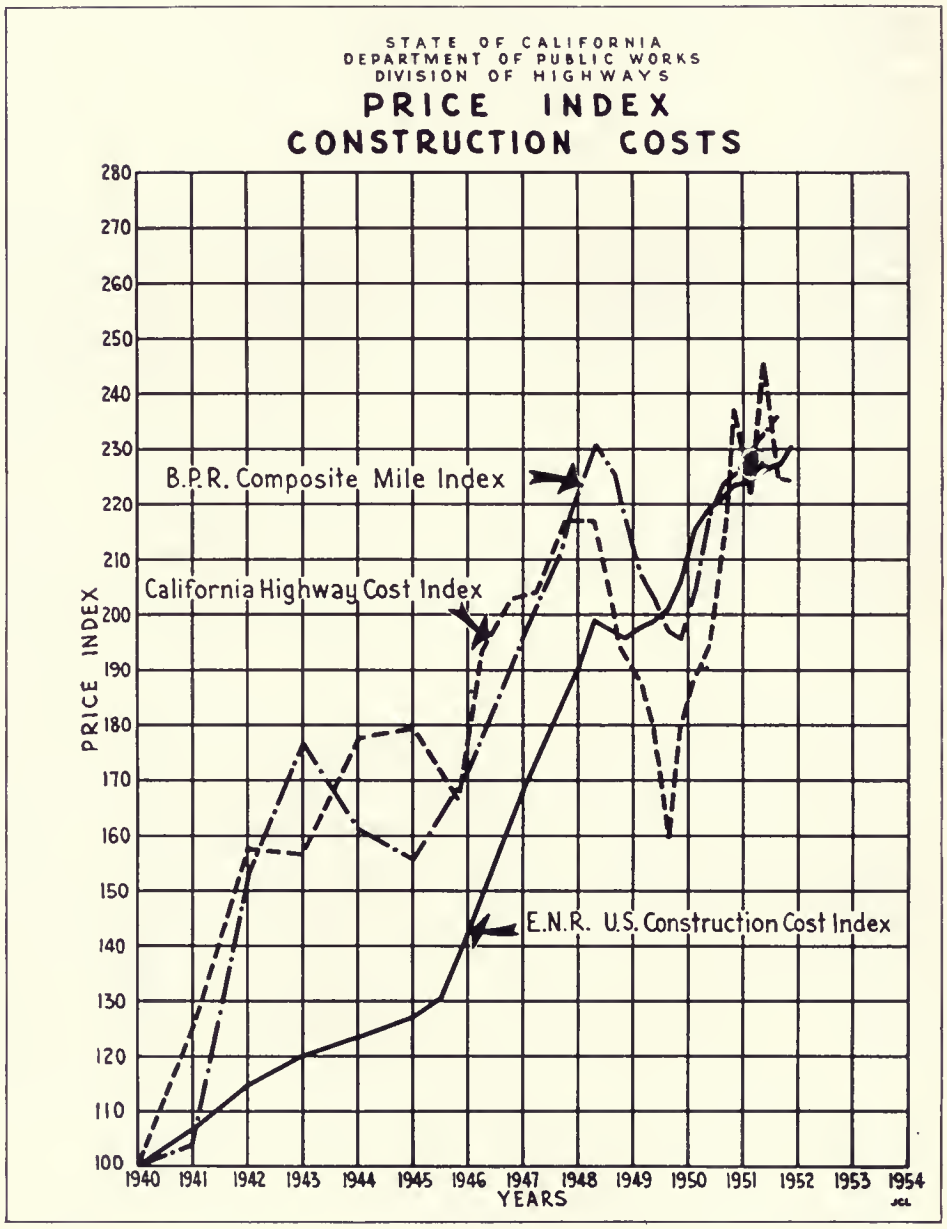
By RICHARD H. WILSON, Assistant State Highway Engineer;
H. C. McCARTY, Office Engineer;
JOHN D. GALLAGHER, Assistant Office Engineer

COMPUTATION of the California Highway Construction Cost Index for the second quarter of 1952 shows that during the months of April, May, and June construction prices held to the level of the first quarter, the index dropping only two-tenths of one percent. The cost index for the second quarter was 224.4 (1940=100) as compared to 224.8 for the first quarter. This second quarter figure is 21 points or 8.6 percent below the high of 245.4 in the fourth quarter of 1951.

Lack of Stability in Trend

In reporting on the drop of the California index during the first quarter in the May-June issue of this periodical the current lack of stability in the trend of California highway construction costs was noted and the comment was made that a firm downward trend was not anticipated for some time. This statement still holds as it is thought that the standstill of the second quarter is the result of a "watchful-waiting" policy on the part of contractors who appear to be holding prices at a level until the steel situation and other management-labor disputes are settled. With wage increases anticipated in connection with the several current strikes it is difficult to foresee anything but increased construction costs when the new agreements become effective.

Compared with the 0.2 percent drop in the California Highway Construction Cost Index during the second quarter of 1952, the Engineering News-Record Construction Cost Index continued its steady upward trend rising 1 percent from 227.0 to 230.5 (1940 = 100) during the months of April, May and June. The Engineering News-Record Index, based upon labor and material costs of all types of construction over the entire Nation, will, of course, vary to some degree from the California index which is based on actual bid prices of highway construction only and which is more noticeably subject to fluctuations due to local economic conditions.



The Bureau of Public Roads Composite Mile Index for the second quarter of 1952 shows an increase of 1.6 percent over the first quarter of the year. This nation-wide highway cost index of the Bureau of Public Roads rose from 236.2 to 240.0 (adjusted to a base of 1940 = 100). Because of its

national characteristics the Composite Mile Index follows the trends of the Engineering News-Record Index more closely than does the California Highway Construction Cost Index.

Unit Price for Cement at High Level

In general, the average contract unit prices for the eight major construction items on which the index is based eased off slightly during the second quarter, with the exceptions that structure concrete and plant-mixed surfacing increased 3.5 percent and 7.8 percent respectively. While there was little change in the average unit price for Portland cement concrete pavement it should be noted that it remains at the same high level which has obtained in recent months. The rise in the average price of structure concrete probably stems from increased labor costs for carpenters and it is thought that the rise in the average price of plant-mixed surfacing results from the current strike and demands for wage increases by equipment operators in Southern California.

A tabulation of these average contract prices from 1940 to the present accompanies this article.

No Lack of Competition

The California Division of Highways cannot register any serious complaint on the grounds of lack of competition in bidding on state highway work. The accompanying tabulation of average number of bidders, broken down to jobs of various sizes awarded during the past fiscal year conforms to experience of previous years; the smaller

CALIFORNIA HIGHWAY CONSTRUCTION COST INDEX

Period	Index 1940=100	Change from previous period	Change from 1948	Change from 1st qtr. 1950
1940	100	———	———	———
1941	125.0	+25.0%	———	———
1942	157.5	+26.0%	———	———
1943	156.4	— 0.7%	———	———
1944	177.8	+13.7%	———	———
1945	179.5	+ 1.0%	———	———
1946	179.7	+ 0.1%	———	———
1947	203.3	+13.1%	———	———
1948	216.6	+ 6.5%	———	———
1949	190.7	—12.0%	———	———
1950 (1st qtr.)	160.0	—10.5%	—26.1%	———
1950 (2d qtr.)	180.0	+12.5%	—16.9%	+12.5%
1950 (3d qtr.)	189.2	+ 5.1%	—12.7%	+18.3%
1950 (4th qtr.)	194.8	+ 3.0%	—10.1%	+21.8%
1951 (1st qtr.)	215.4	+10.6%	— 0.6%	+34.6%
1951 (2d qtr.)	238.3	+10.6%	+10.0%	+48.9%
1951 (3d qtr.)	221.9	— 6.9%	+ 2.4%	+38.7%
1951 (4th qtr.)	245.4	+10.6%	+13.3%	+53.4%
1952 (1st qtr.)	224.8	— 8.4%	+ 3.7%	+40.5%
1952 (2d qtr.)	224.4	— 0.2%	+ 3.5%	+40.3%

CALIFORNIA DIVISION OF HIGHWAYS

AVERAGE CONTRACT PRICES

	Roadway excavation, per cu. yd.	Crusher run base, per ton	Plant-mix surfacing, per ton	Asphalt concrete pavment, per ton	PCC pavement, per cu. yd.	PCC structures, per cu. yd.	Bar reinforcing steel, per lb.	Structural steel, per lb.	
1940	$0.22	$1.54	$2.19	$2.97	$7.68	$18.33	$0.040	$0.083	All projects
1941	0.26	2.31	2.84	3.18	7.54	23.31	0.053	0.107	
1942	0.35	2.81	4.02	4.16	9.62	29.48	0.073	0.103	
1943	0.42	2.26	3.71	4.76	11.48	31.76	0.059	0.080	
1944	0.50	2.45	4.10	4.50	10.46	31.99	0.054	0.132	
1945	0.51	2.42	4.20	4.88	10.90	37.20	0.059	0.102	
1st Half, 1946	0.41	2.31	4.00	4.54	9.85	37.38	0.060	0.099	Federal aid projects only
2d Half, 1946	0.39	2.27	4.12	5.04	12.39	49.84	0.079	0.142	
1st Half, 1947	0.48	2.62	4.52	6.46	12.41	47.03	0.080	0.133	
2d Half, 1947	0.54	2.39	4.02	6.48	11.58	50.15	0.089	0.123	All projects
1st Half, 1948	0.56	2.45	4.42	4.91	13.37	49.51	0.094	0.145	
2d Half, 1948	0.52	2.64	4.80	7.00	14.01	49.08	0.103	0.131	
1st Quarter, 1949	0.49	2.48	4.54	5.70	11.84	48.11	0.089	0.113	
2d Quarter, 1949	0.43	2.91	4.63	4.06	11.74	48.63	0.083	0.110	
3d Quarter, 1949	0.41	2.40	5.05	4.60	11.53	45.35	0.080	0.093	
4th Quarter, 1949	0.43	2.55	3.78	3.50	12.66	44.54	0.078	0.092	
1st Quarter, 1950	0.34	2.22	3.65	3.74	———	40.15	0.077	0.081	
2d Quarter, 1950	0.40	2.13	4.48	3.74	10.86	43.03	0.080	0.105	
3d Quarter, 1950	0.41	2.32	4.25	5.50	10.91	44.34	0.093	0.131	
4th Quarter, 1950	0.42	2.81	4.64	4.61	12.55	43.18	0.098	0.120	
1st Quarter, 1951	0.45	3.07	4.06	5.22	11.71	46.38	0.103	0.206	
2d Quarter 1951	0.63	3.88	4.56	4.63	12.93	51.50	0.105	0.166	
3d Quarter, 1951	0.56	2.88	4.59	3.90	12.41	46.14	0.107	0.165	
4th Quarter, 1951	0.66	2.91	5.66	4.89	12.71	49.38	0.105	0.169	
1st Quarter, 1952	0.56	3.25	4.88	4.77	14.25	47.46	0.094	0.152	
2d Quarter, 1952	0.53	3.19	5.29	4.13	14.20	49.12	0.091	1.143	

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Traffic Relief

Continued from page 33 . . .

Relief, however, is now in sight for both local and through traffic as actual construction work on a full freeway through the City of San Luis Obispo started last March. To date three separate contracts have been let covering various portions of the work. The first contract provides for the construction of a railroad underpass and grade separations at the freeway intersections with Santa Rosa and Ida Streets. The second contract provides for the construction of grade separation structures at the freeway intersections with Marsh and Chorro Streets and a large culvert at Stenner Creek. The third contract provides for the construction of grade separation structures at the Grand and Buena Vista Avenue intersections. Work on the second and third contracts is well under way. However, due to difficulties in obtaining structural steel for the railroad underpass, work on the first contract has not yet started. The contractor was informed recently that the structural steel would be rolled in the east and that he would receive it this fall. The steel strike could cause a somewhat longer delay in the progress on this contract.

A contract for grading and paving will be necessary to complete the full freeway development through the city. Plans for this work are in the final stages and it is hoped work on the structures will have advanced sufficiently to permit letting this final work to contract shortly after January 1, 1953. Provided no unforeseen difficulties develop and the work can be carried to completion without interruption, it is anticipated the entire project should be completed in the latter part of 1954.

FAST RESURFACING JOB DONE ON FIRST STREET

Livermoreans who observed the improvement of First Street were amazed by the speed and efficiency with which the State Division of Highways crew operated.

A truck dumped a load of surfacing material into the hopped of a spreader which deposited it evenly in a strip and a roller immediately following completed the job. The three machines moved along slowly but steadily, and the job was done in surprisingly short time, with virtually no interference with traffic and parking interfered with less than had been expected.

Cars were driving over the new surface within a few minutes after it was laid.—*Livermore Herald.*

District IX

Continued from page 41 . . .

Fifteen miles north of Bishop and just over the Inyo-Mono county line U. S. 395 is confronted with the once formidable Sherwin Grade which rises to an elevation of 6,417 feet on 4.6 miles of sustained 6 percent grade. For the next 120 miles, all in Mono County, U. S. 395 traverses what is a fairyland in winter and a wonderland in the summer.

U. S. 395 leads the tourist through the heart of this recreation area; past Crowley Lake, the home of the big fish; Convict Lake; Whitmore Hot Springs; Mammoth Lakes and Mammoth Mountain whose slopes provide skiing well into the middle of the summer months; Casa Diablo Hot Springs; Deadman Summit at elevation 8,041 feet; then down past the Devil's Punch Bowl; magnificent June Lake; Leevining, where the Tioga Pass road joins U. S. 395, the Mono Craters, saline Mono Lake; then up and over bleak Conway Summit, again above 8,000 feet elevation; and into Bridgeport, the quaint and quiet county seat of Mono County. Northerly U. S. 395 rises over Devil's Gate Summit and then takes the tourist past Fales Hot Springs, picks up the Sonora Pass traffic and winds through the canyon of the West Walker River to the verdant pasture lands of Antelope Valley and the town of Coleville.

North of Coleville, Robert Downer of Reno, Nevada, has a $36,000 contract under way to remove three bad curves and to substitute one tangent in their stead.

U. S. 395 leaves California at Topaz Lake and enters the State of Nevada, after having passed through some of the most beautiful and breath-taking scenery in the world.

Harbor Freeway Temporary Field For Helicopters

By P. O. HARDING

Assistant State Highway Engineer

From July 9 to 12, 1952, inclusive, the City of Los Angeles was host to the Aviation Writers Association during its fourth annual convention. Starting from headquarters at the Ambassador Hotel, the convention activities included trips through the local aircraft manufacturing plants and to the more distant military installations at Muroc, Inyokern, and El Toro.

On July 11th the morning program included demonstrations at the El Toro Marine Air Base near Santa Ana, and the afternoon schedule called for demonstrations at MacArthur Park in Los Angeles. Going by bus would have consumed too much time; therefore, the U. S. Marines undertook to transport the delegates by plane and helicopter. The delegates left early in the morning by plane from the Los Angeles International Airport, flying to the El Toro Marine Air Base, and at noontime they were transported by U. S. Marine Corps helicopters from the El Toro Marine Air Base back to Los Angeles.

It was determined by the convention managers that one and one-half hours' time could be saved if a landing field for the helicopters could be secured in close proximity to MacArthur Park in the Westlake District. The two recently completed Portland cement concrete roadways, each paved 60 feet wide with a 12-foot central dividing strip, on the Harbor Freeway between First and Second Streets, offered ideal landing field for helicopters. This newly constructed pavement is on the Webb & White unfinished contract calling for grading, paving, and miscellaneous construction to complete the Harbor Freeway from Temple Street to Fourth Street, and arrangements were made with this contractor for the helicopters to land on the pavement.

The City of Los Angeles, as host, provided a number of police officers to keep the crowds back, city street

. . . *Continued on page 63*



UPPER—View looking northerly along Harbor Freeway with 4-level grade separation structure in background, showing two U. S. Marine helicopters about to land on the freeway pavement between the First Street and Second Street undercrossing bridges. NEXT—U. S. Marine helicopter dischorging delegotes attending the Aviation Writers Association convention in Los Angeles. CENTER—Looking northerly along Harbor Freeway with 4-level grade separation bridge in background (right), showing U. S. Marine helicopter above First Street undercrossing bridge about to make landing. LOWER—U. S. Marine helicopter heading south on Harbor Freeway about to land and discharge possengers on the completed pavement between Second and Third Streets undercrossing bridges.

HIGHWAY BIDS AND AWARDS

May, 1952—Continued

CONTRA COSTA COUNTY—Across Carquinez Straits at Crockett, a portion of the existing bridge at the southerly end to be repaired with reinforced concrete construction. District X, Route 7, Section A. Contract awarded to Bos Construction Co., Oakland, $11,090.

CONTRA COSTA COUNTY—On Standard Avenue between Oil Street and Marine Street in Richmond, about 0.6 mile to be graded and surfaced with plant-mixed surfacing on cement treated base. District IV, Route 69. J. Henry Harris, Berkeley, $259,968; James R. Armstrong, El Cerrito, $268,839. Contract awarded to Lee J. Immel, San Pablo, $246,780.

LOS ANGELES COUNTY—In the City of Burbank, on San Fernando Road, between Brighton Street and Cohasset Street, about 1.1 miles, paving with asphalt concrete pavement on existing surfacing and on cement treated base material. District VII, Route 4. Jesse S. Smith, Glendale, $75,460; Griffith Company, Los Angeles, $78,980. Contract awarded to Schroeder & Company, Sun Valley, $72,350.

LOS ANGELES COUNTY—On Pear Blossom Highway, between Palmdale and Old Nadeau Road, a distance of 1.4 miles, to be graded and surfaced with plant-mixed surfacing on untreated rock base. District VII, Route 59, Section J. Baker & Pollock, Ventura, $108,821; Jesse S. Smith, Glendale, $109,-014; Schroeder & Company, Sun Valley, $118,380; Osborn Co., Pasadena, $124,901. Contract awarded to E. C. Young, San Fernando, $94,666.90.

LOS ANGELES COUNTY—On Harbor Freeway at Olympic Boulevard, in the City of Los Angeles, a reinforced concrete bridge to be constructed and about 0.1 mile of city streets to be reconstructed. District VII, Routes 165, 173. Oberg & Cook, Gardena, $322,995; Tumblin Co., Bakersfield, $329,613; J. E. Haddock, Ltd., Pasadena, $334,575; W. J. Disteli, Los Angeles, $334,732; Webb & White, Los Angeles, $356,157; George W. Peterson & Jack W. Baker, Los Angeles, $359,019; Charles MacClosky Co., San Francisco, $368,288. Contract awarded to Oberg Bros. Construction Co., Inglewood, $313,814.

LOS ANGELES COUNTY—On Los Angeles River Freeway, between 0.2 mile south of Dominguez Street and Del Amo Boulevard, two railroad underpasses to be constructed and about 0.7 mile to be graded and surfaced with Portland cement concrete pavement on cement treated subgrade over imported base material and imported subbase material or imported pervious material, for a six-lane divided highway. District VII, Route 167, Section A. Guy F. Atkinson Co., Long Beach, $1,174,906; B. J. Ukropina, T. P. Polich, Steve Kral, Baldwin Park, $1,207,544; J. E. Haddock, Ltd., Pasadena, $1,236,-318; Griffith Company, Los Angeles, $1,351,616. Contract awarded to Webb & White, Los Angeles, $1,155,929.50.

MADERA COUNTY—Between 3.5 miles and 10.8 miles east of Merced county line, about 7.2 miles to be widened with imported borrow and imported subbase material and surfaced with plant-mixed surfacing on untreated rock base. District VI, Route 32, Section A. Clements & Co., Hayward, $254,700; Stewart & Nuss, Inc., Fresno, $261,074; Harms Bros., Sacramento, $282,975; Granite Construction Co., Watsonville, $287,315; B. J. Ukropina, T. P. Polich, Steve Kral, Baldwin Park, $287,-532; Ball & Simpson, Berkeley, $290,613; A. Teichert & Son, Inc., Sacramento, $317,694; M. J. B. Construction Co., Stockton, $326,509; Leo F. Piazza Paving Co., San Jose, $353,109. Contract awarded to Volpa Brothers, Fresno, $226,920.

ORANGE COUNTY—Between Route 60 and 0.2 mile north of Garfield Avenue, about 2.8 miles to be graded and surfaced with plant-mixed surfacing on untreated rock base. District VII, Route 171, HntB,A. Sully-Miller Contracting Co., Orange, $374,041; R. J. Noble Co. & R. J. Nohle, Orange, $381,957; Pacific Contracting Corp., Newport Beach, $429,264; Roland R. Reynolds, Anaheim, $469,930. Contract awarded to Cox Bros. Construction Co., Stanton, $360,264.50.

SACRAMENTO COUNTY—Across American River near Elvas, about one mile northeast of Sacramento, the superstructure for a bridge to be constructed. District III, Route 98, Section B. Bates & Rogers Construction Corp., San Francisco, $1,026,-825; George Pollock Co., Sacramento, $1,053,374; Lord & Bishop, Sacramento, $1,054,655; Carl N. Swenson Co., Inc., San Jose, $1,058,185; Chas. L. Harney, Inc., San Francisco, $1,071,338; Granite Construction Co., Watsonville, $1,072,645; John C. Gist, Sacramento, $1,091,355; Rothschild, Raffin & Weirick, San Francisco, $1,106,222; A. Teichert & Son, Inc., Sacramento, $1,108,760. Contract awarded to B. J. Ukropina, T. P. Olich, and Steve Kral, Baldwin Park, $1,003,903.70.

SAN FRANCISCO COUNTY—On Bayshore Freeway between 16th Street and 7th Street, a portion of a bridge and miscellaneous road work to be constructed. District IV, Route 68. Peter Kiewit Sons' Co., Arcadia, $2,993,237; Charles MacClosky Co. & Eaton & Smith, San Francisco, $3,076,555; Chas. L. Harney, Inc., San Francisco, $3,083,537; Bates & Rogers Construction Corp., San Francisco, $3,148,273; Stolte Inc. and The Duncanson-Harrelson Co., Oakland, $3,117,205; Fredrickson & Watson Construction Co. & M & K Corp., Oakland, $3,168,-143. Contract awarded to Guy F. Atkinson Co., South San Francisco, $2,986,961.10.

SANTA BARBARA COUNTY—Between Black Road and Point Sal Road, about 5.5 miles, to be surfaced with untreated rock surfacing and imported base material, and seal coat and penetration treatment to be applied. District V, Route 56, Section E. Baker & Pollock, Ventura, $92,721; Hermreck & Easter, Santa Maria, $97,008; Granite Construction Co., Watsonville, $99,348; Madonna Construction Co., San Luis Obispo, $99,595. Contract awarded to Valley Paving and Construction Co., Inc., Pismo Beach, $77,927.50.

SHASTA COUNTY—Portions between Montgomery Creek and 0.7 mile east of Hatchet Creek, about 3.4 miles, to be surfaced with plant-mixed surfacing and drainage facilities to be installed. District II, Route 28, Section C. Morgan Construction Co., Redding, $55,684; O'Connor Bros., Red Bluff, $63,054. Contract awarded to Fredrickson & Watson Construction Co., Oakland, $49,354.50.

TEHAMA COUNTY—Across Deer Creek about 48 miles northeast of Chico, a reinforced concrete slab bridge to be constructed and approaches and a detour to be graded. District II, Route 47, Section B. Tumblin Co., Bakersfield, $88,656; Young & Smith Construction Co., Salt Lake City, $95,152; E. A. Forde Co., San Anselmo, $97,977; Al Erickson & Co., Napa, $110,822; B. S. McElderry, Berkeley, $112,-856; LeFever & Bing, West Sacramento, $124,124; O'Connor Bros., Red Bluff, $127,421; Bos Construction Co., Oakland, $133,223. Contract awarded to R. E. Hertel, Sacramento, $87,465.

TULARE COUNTY—City of Tulare, at the intersection of Tulare Street and M Street, furnishing and installing traffic signal system. District VI, Route 134. Robinson Electric, Fresno, $6,200; Dale Electric, Fresno, $6,500; R. O. Ferguson Co., Visalia, $8,068. Contract awarded to Leonardi Electric Construction Co., San Rafael, $5,150.

F. A. S. County Routes

MENDOCINO COUNTY—On Ukiah-Boonville Road, between 2.9 miles and 4.8 miles west of State Highway Route 1, about 1.9 miles to be graded. District I, FAS Route 980. Cecil L. Moore, San Leandro, $161,041; Ball & Simpson and T. E. Irving, Berkeley, $167,986; Huntington Bros., Napa, $168,584; Eaton & Smith, San Francisco, $173,294; Harms Bros., Sacramento, $173,339; Humboldt Constructors, Inc., Eureka, $179,045; H. Earl Parker, Inc., Marysville, $205,659. Contract awarded to C. V. Kenworthy, Stockton, $140,378.

June, 1952

ALAMEDA COUNTY—Between the Toll Plaza and the easterly terminus of the San Francisco-Oakland Bay Bridge, underground multiconductor control cable to be constructed. District IV, Route 5. Manning & Whitaker, Inc., San Francisco, $49,232; Underground Electric Construction Co., Oakland, $55,875; H. S. Tittle Co., San Francisco, $55,267; Hall Sloat Electric Co. Inc., Oakland, $57,800; Crabbe Electric, Pittsburg, $65,438. Contract awarded to Severin Electric Co., San Francisco, $47,839.

ALAMEDA COUNTY—Eastshore Freeway, between Distribution Structure and Ashby Avenue, about 1.5 miles to be graded and surfaced with portland cement concrete pavement and plant-mixed surfacing on cement treated base and separation structures to be constructed. District IV, Route 69. Charles L. Harney, Inc., San Francisco, $2,563,058; Carl N. Swenson Co. Inc., Ball & Simpson, Berkeley, $2,690,723; Stolte Inc., The Duncanson-Harrelson Co. & Lee J. Immel, Oakland, $2,834,730; Fredrickson & Watson Construction Co. and M & K Corp., Oakland, $3,112,896. Contract awarded to Peter Kiewit Sons' Co., San Francisco, $2,552,500.

ALAMEDA COUNTY—Three miles east of Niles, the girder spans of bridge across Alameda Creek to be cleaned and painted. District IV, Route 107, Section A. R. W. Reade & Co., Berkeley, $1,684; D. E. Burgess Co., San Francisco, $2,297; John P. McGuire, San Jose, $3,400; D. Zelinsky & Sons, San Francisco, $3,600; Deemer & Deemer, San Francisco, $3,850. Contract awarded to Russell Hinton Co., San Francisco, $1,645.

AMADOR AND CALAVERAS COUNTIES—Between 0.4 mile southeast of Jackson and 1.5 miles west of Mokelumne Hill, about 4.5 miles to be graded and surfaced with plant-mixed surfacing on imported base material. District X, Route 65, Sections C,A. R. P. Shea Co., Indio, $399,972; Elmer J. Warner, Stockton, $409,244; Harms Bros., Sacramento, $418,530; A. Teichert & Son, Inc., Sacramento, $445,905; H. Earl Parker, Inc., Marysville, $456,368; McCammon-Wunderlich Co., Palo Alto, $472,481; B. J. Ukropina, T. P. Polich, Steve Kral, Baldwin Park, $552,470. Contract awarded to Claude C. Wood Co., Lodi, $361,574.40.

BUTTE COUNTY—Across Dry Creek about 11.5 miles south of Chico, repairing a bridge. District III, Route 87, Section B. O'Conner Bros., Red Bluff. Contract awarded to Ted Schwartz, Grass Valley, $12,580.

COLUSA COUNTY—Between 0.2 mile east of Colusa Basin Bridge and Colusa, about 2.2 miles, cement treatment to be applied to the existing surfacing and Class "B-Single" seal coat placed. District III, Route 15, Section A,Cln. Harms Bros., Sacramento, $32,677; Clements & Co., Hayward, $38,160; W. H. O'Hair Company, Colusa, $38,225; Lefever & Bing, West Sacramento, $38,915; Rice Brothers Inc., Marysville, $40,003. Contract awarded to Claude C. Wood Co., Lodi, $31,742.50.

CONTRA COSTA COUNTY—In the City of San Pablo, at the intersection of San Pablo Avenue with Broadway Avenue-Balboa; a traffic signal system and highway lighting to be furnished and installed and channelization to be constructed. District IV, Route 14. J. Henry Harris, Berkeley, $13,214; R. Flatland, San Francisco, $13,750; Underground Electric Construction Co., Oakland, $14,505. Contract awarded to Goold & Son, Stockton, $12,860.

CONTRA COSTA COUNTY—Between one mile south of Pacheco and Monument, about 1.5 miles, shoulders to be constructed of untreated rock base and borders to be surfaced with plant-mixed surfacing. District IV, Route 75, Section H. Louis Biasotti & Son, Stockton, $63,359; J. Henry Harris, Berkeley, $64,314; Lee J. Immel, San Pablo, $65,735; John B. Paroline, Morgan Hill, $71,059; Eugene G. Alves, Pittsburg, $86,435; O. C. Jones and Sons, Berkeley, $80,777. Contract awarded to J. R. Armstrong, El Cerrito, $59,985.25.

DEL NORTE COUNTY—Portions along the Smith River, between 14.1 miles and 30.8 miles northeast of Crescent City, about 1.4 miles, existing roadbeds to be widened and graded and road-mixed surfacing to be placed. District I, Route 1, Sections C,D,E. J. Henry Harris, Berkeley, $249,302. Contract awarded to John Burman & Sons, Eureka, $248,802.50.

DEL NORTE COUNTY—Between Oregon Mountain and Oregon state line, about 1.8 miles, to be surfaced with plant-mixed surfacing on cement treated base and a reinforced concrete bridge across Elk Creek to be widened. District I, Route 1, Section E. Contract awarded to Mercer Fraser Co. & Mercer Fraser Gas Co., Inc., Eureka, $144,999.70.

HUMBOLDT COUNTY—Across Eureka Slough and Mad River and over the Northwestern Pacific Railroad Company tracks near Beatrice and near Arcata, four existing steel bridges to be cleaned and painted. District I, Route 1, Sections G,H,I. J. S. Morris Co., Berkeley, $29,880; John P. McGuire, San Jose, $42,950; J. P. Carroll Company, Los Angeles, $87,578. Contract awarded to Orrell-Keefe Co., Oakland, $28,853.

HUMBOLDT COUNTY—At first crossing of Van Duzen River, imported base material to be furnished and stockpiled. District I, Route 35, Section B. Contract awarded to Mercer, Fraser Co. & Mercer, Fraser Gas Co., Inc., Eureka, $19,800.

IMPERIAL COUNTY—Between East Highline Canal and junction with Route 202, about 11.8 miles of roadbed to be resurfaced with plant-mixed surfacing. District XI, Route 27, Section A. G. W. Ellis Construction Co., North Hollywood, $147,790; R. R. Hensler, Sun Valley, $150,778. Contract awarded to Basich Bros. Construction Co., N. L. Basich-R. L. Basich, Garvey, $141,650.

LOS ANGELES COUNTY—In the City of Los Angeles, portions between Virginia Avenue and Los Angeles Street, about 2 miles, roadside areas to be prepared and planted. District VII, Route 2. Justice-Dunn Co., Oakland, $123,187; Jannoch Nurseries, Altadena, $132,813; James E. Boothe, Compton, $142,710. Contract awarded to Henry C. Soto Corp., Los Angeles, $96,074.07.

LOS ANGELES COUNTY—Completion of a partially finished contract for the construction of State Route 4 between north city limits of Los Angeles, near Tunnel Station Bridge, and Pico Canyon Road, about 5.1 miles in length. District VII, Route 4, Section LA,F. Bressi & Bevanda Constructors, Inc., North Hollywood, $530,842; J. E. Haddock, Ltd., Pasadena, $533,820; Peter Kiewit Sons' Co., Arcadia, $552,659; Basich Bros. Construction Co., N. L. Basich & R. L. Basich, Garvey, $576,553; Ball and Simpson, Berkeley, $615,849. Contract awarded to A. Teichert & Son, Inc., Sacramento, $508,216.

LOS ANGELES COUNTY—On Ramona Freeway, in the Cities of Pomona and Claremont, seven reinforced concrete bridges to be constructed and about 0.54 mile of city streets to be widened and surfaced with asphalt concrete pavement. District VII, Route 26. Charles MacClosky Company, San Francisco, $1,227,966; W. F. Maxwell & C. G. Willis & Sons, Inc., Los Angeles, $1,233,687; Guy F. Atkinson Co., Long Beach, $1,234,315; Winston Bros. Company, Monrovia, $1,267,516; A. Teichert & Son, Inc., Sacramento, $1,294,964; Ukropina, Polich, Kral, Baldwin Park, $1,295,478; W. J. Disteli & R. J. Daum Construction Co., $1,301,165; Oberg & Cook, O. B. Pierson & P. D. Ware, Paramount, $1,312,745; J. E. Haddock, Ltd., Pasadena, $1,409,607. Contract awarded to R. M. Price, Altadena, $1,206,625.30.

LOS ANGELES COUNTY—In the City of Redondo Beach, on Pacific Coast Highway at Elena Avenue and Avenue H, traffic signal system and highway lighting to be furnished and installed and channelization to be constructed. District VII, Route 60. Harry F. Brewer, Long Beach, $8,605; Fischbach and Moore, Inc., Los Angeles, $9,488; Ed Seymour, Long Beach, $9,750; Westates Electrical Construction Co., Los Angeles, $10,325. Contract awarded to Electric and Machinery Service, Inc., South Gate, $7,756.

LOS ANGELES COUNTY—At the intersections of Atlantic Boulevard with Bandini Boulevard and with Shiela Street and Firestone Boulevard with Pioneer Boulevard, traffic-actuated signal systems and highway lighting to be furnished and installed or modified. District VII, Routes 167, 174, Sections A,B. Electric and Machinery Service, Inc., South Gate, $38,200; Fischbach and Moore, Inc., Los Angeles, $39,100; Ed Seymour, Long Beach, $40,895. Contract awarded to Westates Electrical Construction Co., Los Angeles, $37,898.

LOS ANGELES COUNTY—Artesia Avenue, between east city limits of Long Beach (Downey Avenue) and Palo Verde Avenue, about 2.5 miles in length, a graded roadbed to be constructed and surfaced with plant-mixed surfacing on untreated rock base; portions of the existing roadbed to be surfaced with plant-mixed surfacing on existing pavement, and seal coats to be applied, to provide a four-lane divided highway. District VII, Route 175, Section B. Vido Kovacevich Co., South Gate, $377,286; R. J. Noble Co. and R. J. Noble Joint License, Orange, $396,165; C. O. Sparks, Inc., and Mundo Engineering Co., Los Angeles, $407,242; J. E. Haddock, Ltd., Pasadena, $415,187; Griffith Co., Los Angeles, $431,267. Contract awarded to Warren Southwest, Inc., Torrance, $374,873.40.

MARIN COUNTY—At Dolan's Corner, about 2.5 miles northwesterly of Sausalito, about 0.4 mile to be surfaced with plant-mixed surfacing on crusher run base and crusher run base (cement treated). District IV, Route 56, Section A. A. G. Raisch Co., San Rafael, $60,651; J. Henry Harris, Berkeley, $68,490. Contract awarded to Brown-Ely Co., Contractors, Corte Madera, $56,290.60.

MENDOCINO COUNTY—At Ten Mile Creek, about three miles south of Laytonville, about 0.3 mile to be graded and roadmixed surfaced on cement treated base. District I, Route 1, Section H. J. Henry Harris, Berkeley, $68,125; O'Connor Bros., Red Bluff, $77,596. Contract awarded to Pike & Hill, Carey Bros. & Bailey, San Rafael, $60,310.

MENDOCINO COUNTY—At Rattlesnake Creek, about one mile south of Cummings Post Office, a reinforced concrete arch culvert to be constructed, a fill to be placed thereon, and about 0.45 mile of road to be graded and surfaced with road-mixed surfacing on cement-treated base. District I, Route 1, Section I. Fredrickson Bros., Emeryville, $612,132; Tumblin Co., Bakersfield, $682,125; Rotbschild, Raffin & Weirick, San Francisco, $685,406. Contract awarded to Eaton & Smith, San Francisco, $516,184.60.

MENDOCINO COUNTY—Between the Northwestern Pacific underpass and Eleven Oaks, about two miles, portions to be surfaced with plant-mixed surfacing on cement treated base and portions to be graded and surfaced with plant-mixed surfacing on cement treated base. District I, Route 1, Section E. Harms Bros., Sacramento, $253,439; Eaton & Smith, San Francisco, $269,235. Contract awarded to Pike & Hill, Carey Bros. & Bailey, San Rafael, $241,716.75.

MERCED COUNTY—Between 5.6 miles south of Merced and Merced, about 5.6 miles, existing road to be resurfaced with plant-mixed surfacing on untreated rock base. District X, Route 4, Section A, Mer. A. Teichert & Son, Inc., Sacramento, $329,279; Stewart & Nuss, Inc., Fresno, $352,394; Munn & Perkins, Modesto, $353,268; Granite Construction Co., Watsonville, $353,967; Ukropina, Polich & Kral, Baldwin Park, $357,570; M. J. B. Construction Co., Stockton, $391,288; Gordon H. Ball & San Ramon Valley Land Co., Berkeley, $413,303. Contract awarded to Fredrickson & Watson Construction Co., Oakland, $310,747.60.

MERCED COUNTY—Across the Merced River at Cox Ferry, about 12 miles north of Merced, a reinforced concrete girder bridge to be constructed and about 0.6 mile of approaches to be graded and surfaced with plant-mixed surfacing on untreated rock base. District X, Route 123, Section B. Granite Construction Co., Watsonville, $212,853; Ukropina, Polish, Kral, Baldwin Park, $245,725; Trewhitt, Shields & Fisher, Fresno, $248,105; Young & Smith Construction Co., Salt Lake City, $248,823; Bishop, Younger, Bradley Co., San Francisco, $257,387; Thomas Construction Co. & H. Earl Parker, Inc., Fresno, $262,736; C. K. Moseman, Redwood City, $278,648; Charles MacClosky Co., San Francisco, $322,613. Contract awarded to Tumblin Company, Bakersfield, $190,717.

MONTEREY COUNTY—Between Alisal Road in Salinas and 0.5 mile northwesterly of North Main Street, about 1.6 miles, to be graded and portions to be surfaced with Portland cement concrete pavement on cement treated subgrade and plant-mixed surfacing on cement treated base and two reinforced concrete bridges and two double 12-foot box culverts to be constructed, to provide a four-lane divided highway. District V, Route 2. Granite Construction Co., Watsonville, $1,010,710; Lord & Bishop & M. J. B. Construction Co., Sacramento, $1,061,971; Fredrickson & Watson Construction Co., Oakland, $1,084,853; Fredericksen & Kasler, Sacramento, $1,104,774; Charles MacClosky Co. & Madoona Construction Co., San Francisco, $1,298,432. Contract awarded to Dan Caputo & Edward Keeble, San Jose, $984,064.

ORANGE COUNTY—In Huntington Beach State Park, construction of a road and furnishing and installing electrical equipment. District VII. Sully-Miller Contracting Company, Orange, $7,995; R. J. Noble Co., Orange, $8,260. Contract awarded to Cox Bros. Construction Co., Stanton, $7,418.

PLACER COUNTY—Between one mile east of Auburn and one mile west of Applegate, about 6.1 miles, seal coat to be applied. District III, Route 37, Section A. J. P. Breen, Sacramento, $19,200; O'Connor Bros., Red Bluff, $19,392; J. Henry Harris, Berkeley, $19,544. Contract awarded to Howard B. Folsom, Westwood, $18,799.80.

PLACER AND EL DORADO COUNTIES—Between 0.4 mile west of Auburn city limit and 1.3 miles south of North Fork American River, about 2.2 miles to be graded and a Class "B-Double" seal coat applied to cement treated imported base material. District III, Route 65, Section Aub., A, A. Harms Bros., Sacramento, $188,486; R. P. Shea Co., Indio, $202,672; J. Henry Harris, Berkeley, $211,794; M. W. Brown, Redding, $212,514; O'Connor Bros., Red Bluff, $228,077; Eaton and Smith, San Francisco, $253,832. Contract awarded to C. W. Peterson, North Hollywood, $178,537.

RIVERSIDE COUNTY—At the intersection of Magnolia Avenue with Arlington Avenue-Palm Avenue in the City of Riverside, traffic signal system to be furnished and installed and channelization to be constructed. District VIII, Route 43. Fischbach and Moore, Inc., Los Angeles, $14,766; Electric and Machinery Service, Inc., South Gate, $15,162. Contract awarded to Paul R. Gardner, Ontario, $12,595.07.

RIVERSIDE AND SAN BERNARDINO COUNTIES—Between Russell Street and San Bernardino county line, about 2.3 miles, shrubs and ground cover to be planted and a watering system to be furnished and installed. District VIII, Route 43, Sections Riv, C, F. Jannoch Nurseries, Altadena, $37,732; Justice-Dunn Co., Oakland, $40,527; James E. Boothe, Compton, $41,598; Tetley Nurseries, Corona, $41,996; Keith E. Card, Long Beach, $44,956; D & M Sprinkler Co., Long Beach, $48,679. Contract awarded to Henry C. Soto Corp., Los Angeles, $31,481.65.

SAN BERNARDINO COUNTY—Between the Los Angeles county line and Route 192, eight reinforced concrete bridges to be constructed. District VIII, Route 26, Section C, Upl. Guy F. Atkinson Company, Long Beach, $787,228; Ukropina, Polich, Kral, Baldwin Park, $787,402; W. F. Maxwell, Los Angeles, $788,475; Winston Bros. Company, Monrovia, $793,622; Granite Construction Co., Watsonville, $828,299; J. E. Haddock, Ltd., Pasadena, $835,501; W. J. Disteli, Los Angeles, $842,085. Contract awarded to Charles MacClosky Company, San Francisco, $746,708.20.

SAN BERNARDINO COUNTY—In the cities of Colton and San Bernardino at the intersections of Mt. Vernon Avenue with Colton Avenue and with La Cadena Avenue-Citrus Street-Grant Avenue, traffic-actuated signal systems and highway lighting to be furnished and channelization to be constructed. District VIII, Route 31, Fischbach and Moore, Inc., Los Angeles, $25,610; Electric and Machinery Service, Inc., South Gate, $26,256. Contract awarded to Paul R. Gardner, Ontario, $25,321.

SAN BERNARDINO COUNTY—At Cajon Maintenance Station, foreman's cottage to be constructed. District VIII, Route 31, Section B. W. L. Castleman, San Bernardino, $10,600; The Mahoney-Morrison Co., Sunland, $11,050; Ted Rehwald Construction Co., San Bernardino, $11,957. Contract awarded to Joseph B. Wallace, San Bernardino, $10,181.93.

SAN BERNARDINO COUNTY—Between Cronise Valley and three miles west of Halloran Springs, about 26.7 miles, existing roadbed to be widened and plant-mixed surfacing placed thereon, and plant-mixed surfacing to be placed on a portion of existing surfacing. District VIII, Route 31, Sections J, K, L. Basich Bros. Construction Co. N. L. Basich and R. L. Basich, Garvey, $249,022; Madonna Construction Co., San Luis Obispo, $254,007; George Herz & Co., San Bernardino, $288,960; R. R. Hensler, Sun Valley, $334,848. Contract awarded to G. W. Ellis Construction Co., North Hollywood, $217,987.

SAN DIEGO COUNTY—Portions between Balboa Avenue in the City of San Diego and Las Flores, about 7.6 miles, to be surfaced with plant-mixed surfacing. District XI, Route 2, Section SD, A, C. Cox Bros. Construction Co., Stanton, $126,419; Griffith Company, Los Angeles, $139,101. Contract awarded to R. E. Hazard Contracting Co., San Diego, $101,921.

SAN DIEGO COUNTY—In the City of San Diego on Pacific Highway at De Anza Cove, about

0.4 mile of roadway to be graded and surfaced and channelization to be constructed. District XI, Route 2. Griffith Company, Los Angeles, $38,967; V. R. Dennis Construction Co., San Diego, $42,874; R. E. Hazard Contracting Co., San Diego, $45,978. Contract awarded to Cox Bros. Construction Co., Stanton, $37,719.25.

SAN FRANCISCO CITY—At the junction of Richardson Avenue off-ramp and Marina connection to Golden Gate Bridge, modify lighting system and construct a gore. District IV, Route 2. R. Flatland, San Francisco, $12,727; L. H. Leonardi, Electric Construction Co., San Rafael, $12,915. Contract awarded to Abbett Electric Corp., San Francisco, $8,551.

SAN JOAQUIN COUNTY—Across the Calaveras River at Bellota, a reinforced concrete bridge to be constructed and about 0.15 mile of approaches to be graded and surfaced with plant-mixed surfacing on untreated rock base. District X, Route 5, Section D. Elmer J. Warner, Stockton, $57,082; George Pollock Co., Sacramento, $57,356; Wheeler Construction Co., Oakland, $60,082; Tumblin Co., Bakersfield, $66,084; Lefever & Bing, West Sacramento, $68,225. Contract awarded to Thomas Construction Co., Fresno, $54,571.20.

SAN LUIS OBISPO COUNTY—Between one mile south of Templeton and 0.2 mile north of Paso Robles, about 9 miles, existing lanes to be widened with plant-mixed surfacing on cement treated base and new lanes to be surfaced with plant-mixed surfacing on cement treated base. District V, Route 2, Section B, PsRs, A. M. J. B. Construction Co., Stockton, $710,911; Griffith Co., Los Angeles, $750,035; Fredrickson & Watson Construction Co., Oakland, $787,888; Madonna Construction Co., San Luis Obispo, $789,972; Ukropina, Polich, Kral, Baldwin Park, $858,411; Fredrickson Bros., Emeryville, $966,655. Contract awarded to Granite Construction Co., Watsonville, $674,331.

SAN MATEO COUNTY—City of South San Francisco, at the intersection of El Camino Real with Hazelwood Drive-Spruce Avenue, full traffic actuated signal system and highway lighting to be furnished and installed and channelization to be constructed. District IV, Route 2. R. Gould & Son, Stockton, $14,781; J. Henry Harris, Berkeley, $15,568; Fred Johnson Electric Co., San Francisco, $16,609; Ets, Hokin & Galvan, San Francisco, $18,182. Contract awarded to R. Flatland, San Francisco, $14,500.

SANTA CLARA COUNTY—At the intersection of Bayshore Highway with Brokaw Road, a traffic signal system and highway lighting to be furnished and installed and channelization to be constructed. District IV, Route 68, Section B. R. Flatland, San Francisco, $13,830; L. H. Leonardi Electric Construction Co., San Rafael, $14,290; Roy M. Butcher, San Jose, $14,864; Howard Electric Co., Gilroy, $14,961; Fields Electric Works, Santa Clara, $15,030; Kurze Electrical Works, San Jose, $16,418. Contract awarded to R. Gould & Son, Stockton, $13,690.

SHASTA COUNTY—At Montgomery Creek, about 32 miles northeast of Redding, a reinforced concrete slab bridge and approaches to be constructed. District II, Route 28, Section C. J. P. Brennan, Redding, $99,094; O'Connor Bros., Red Bluff, $103,299; Eaton & Smith, San Francisco, $107,707; Fredrickson & Watson Construction Co., Oakland, $131,601. Contract awarded to B. S. McElderry, Berkeley, $95,719.

SONOMA COUNTY—Near Honeycomb Gulch, about seven miles north of Jenner, about 0.4 mile to be graded, imported subbase material and imported base material to be placed and surfaced with road-mixed surfacing. District IV, Route 56, Section C. J. Henry Harris, Berkeley, $96,179; Eaton & Smith. San Francisco, $105,510; Contract awarded to Huntington Bros., Napa, $84,196.

SONOMA AND SOLANO COUNTIES—Across Sonoma Creek near Shellville, and across Sonoma Creek and Napa River, about 10 and 2 miles west of Vallejo, three existing bridges to be cleaned and painted. District IV, Route 8, 208, Sections B, A. D. Zelinsky & Sons, San Francisco, $12,320; Bill Reid Painting Service, Sacramento, $18,445; J. S. Morris Co., Berkeley, $19,180; John P. McGuire, San Jose, $35,354. Contract awarded to R. W. Reade & Co., Berkeley, $11,345.

STANISLAUS COUNTY—At five locations in the vicinity of Newman, Crows Landing, and Westley, a total distance of about 19 miles, to be graded and surfaced with plant-mixed surfacing on untreated rock base. District X, Route 41, Sections A, B, New. M. J. Ruddy & Son, Modesto, $174,465; Chas. L. Harney, Inc., San Francisco, $216,458. Contract awarded to Ukropina, Polich & Kral, Baldwin Park, $155,225.60.

TULARE COUNTY—Between 0.5 mile north of Pixley and one mile south of Tipton, about 4.8 miles to be graded and paved with Portland cement concrete on cement treated subgrade and the existing pavement to be resurfaced with plant-mixed surfacing. District VI, Route 4, Sections A, B. Griffith Co., Los Angeles, $590,161; M. J. B. Construction Co., Stockton, $643,926; Ukropina, Polich & Kral, Baldwin Park, $692,531. Contract awarded to Gordon H. Ball and San Ramon Valley Land Co., Berkeley, $552,246.

TUOLUMNE COUNTY—Furnishing and installing highway lighting systems in Jamestown. District X, Route 13, Section B. L. H. Leonardi Electric Construction Co., San Rafael, $6,375; R. Gould & Son, Stockton, $6,930; Collins Electrical Co., Inc., Stockton, $7,162. Contract awarded to Sacramento Electric Works, Sacramento, $5,160.

VENTURA COUNTY—In San Buenaventura Beach State Park, parking areas to be graded and surfaced with plant-mixed surfacing on untreated rock base. District VII. Jesse S. Smith, Glendale, $21,390. Contract awarded to Baker and Pollock, Ventura, $20,805.

VENTURA COUNTY—Portions between point Mugu and Little Sycamore Creek, embankment slopes to be reconstructed and heavy, medium extra heavy and extra heavy stone riprap to be placed. District VII, Route 60, Section A. Contract awarded to J. B. Stringfellow Co., Riverside, $143,857.

VENTURA COUNTY—Across Arroyo Las Posas, about 0.5 mile south of Moorpark, a reinforced concrete bridge to be constructed and about 0.1 mile of approaches to be graded and surfaced with plant-mixed surfacing on untreated rock base. District VII, Route 155, Section B. W. F. Maxwell, Los Angeles, $71,452; Norman I. Fadel, North Hollywood, $74,540; Jesse S. Smith and Service Construction Co. of Southern California, Burbank, $76,051; E. G. Perham, Los Angeles, $79,537; F. Fredenburg, Temple City, $79,881; Charles MacClosky Co., San Francisco, $84,875; N. M. Saliba Company, Los Angeles, $86,957; E. S. & N. S. Johnson, Fullerton, $91,513. Contract awarded to O. B. Pierson, Bellflower, $69,743.20.

YOLO COUNTY—West Sacramento Freeway, near Sacramento, at Third Street west of Tower Bridge, a bridge to be constructed. District III, Route 6, Section C. Lord & Bishop, Sacramento, $73,110; George Pollock Co., Sacramento, $79,990; A. Teichert & Son, Inc., Sacramento, $87,392; Young & Smith Construction Co., Salt Lake City, $87,559. Contract awarded to Ukropina, Polich & Kral, Baldwin Park, $71,944.10.

YOLO COUNTY—On West Sacramento Freeway, between 0.8 mile and 0.1 mile west of Tower Bridge, about 0.7 mile of four-lane divided roadbed to be constructed and a drainage pumping plant to be installed. District III, Route 6, Section C. A. Teichert & Son, Inc., Sacramento, $195,572. Contract awarded to Ukropina, Polich & Kral, Baldwin Park, $188,365.

YOLO COUNTY—Between ½ mile north of Kiesel and 2 miles south of Kiesel, about 2.4 miles, portions to be graded and surfaced with plant-mixed surfacing on untreated rock base and portions to be widened and surfaced with plant-mixed surfacing on untreated rock base. District III, Route 50, Sections E, F. Ukropina, Polich & Kral, Baldwin Park, $217,400; Harms Bros., Sacramento, $253,348; McGillivray Construction Co., Sacramento, $286,533. Contract awarded to A. Teichert & Son, Inc., Sacramento, $217,026.50.

YUBA COUNTY—At the northeasterly city limits of Marysville, about 0.2 mile, construct a graded roadbed, furnish and place untreated rock base and apply Class "B-Double" seal coat. District III, Route 15, Section Mvl, A. Contract awarded to Rice Brothers, Inc., Marysville, $18,828.20.

YUBA COUNTY—Between 0.3 mile west and 1.6 miles east of Seven Mile House, about 1.7 miles, the existing traveled way to be surfaced with road-mixed surfacing on untreated rock base. District III, Route 15, Section A. H. Earl Parker, Inc., Marysville, $28,233; Harms Bros., Sacramento, $32,594. Contract awarded to Rice Bros., Marysville, $25,910.30.

F. A. S. County Routes

BUTTE COUNTY—Between Pennington Road and Wage Road, about 3.3 miles to be graded, imported base material and untreated rock surfacing to be placed and bituminous surface treatment to be applied. District II, Route 758. W. H. O'Hair Co., Colusa, $121,535; LeFever & Bing, West Sacramento, $121,786; Harms Bros., Sacramento, $126,567; O'Connor Bros., Red Bluff, $153,492. Contract awarded to Clements & Co., Hayward, $109,581.50.

INYO COUNTY—Between Glacier Lodge and 4 miles westerly of Big Pine, about 6.4 miles of roadway to be graded and surfaced with road-mixed surfacing. District IX, Route 1069. Nappe Construction Co., Inc., North Hollywood, $222,222; George Herz & Co., San Bernardino, $231,948; Huntington Bros., Napa, $262,060; R. P. Shea Co., Indio, $291,518. Contract awarded to Ball & Simpson, Berkeley, $202,204.10.

MODOC COUNTY—Between Lassen county line and Eagleville, about 9.8 miles to be surfaced with plant-mixed surfacing. District III, Route 513. Clements & Co., Hayward, $155,720; Contract awarded to Harms Bros., Sacramento ,$140,066.

SACRAMENTO COUNTY—On El Centro Road, between Sacramento River Levee and Elkhorn Road, about 5.8 miles to be graded, imported subbase material and crusher run base to be placed and surfaced with armor coat and plant-mixed surfacing. District III, Route 926. A. Teichert & Son, Inc., Sacramento, $349,357; Harms Bros., Sacramento, $350,495; Ukropina, Polich & Kral, Baldwin Park, $361,026. Contract awarded to Brighton Sand & Gravel Co., Sacramento, $348,143.75.

July, 1952

ALAMEDA COUNTY—In the City of Oakland, between San Francisco-Oakland Bay Bridge toll plaza and west end of distribution structure, about 0.25 mile, the existing pavement to be resurfaced with plant-mixed surfacing. District IV, Route 5. J. Henry Harris, Berkeley, $29,310; Chas. L. Harney, Inc., San Francisco, $33,773. Contract awarded to Lee J. Immel, San Pablo, $28,590.50.

ALAMEDA COUNTY—Between Greenville and Hopyard Road, about 11.1 miles, of roadside areas to be prepared and planted. District IV, Route 5, Sections F,B. Stephen L. Visitica, San Mateo, $14,298; Dana R. Tyson Co., Sacramento, $17,479; Huettig, Schrom & Bennett, Inc., Palo Alto, $19,845; Leonard Coates, Nurseries, Inc., San Jose, $20,731; Justice-Dunn Co., Oakland, $21,531. Contract awarded to Watkin & Sibbald, San Anselmo, $13,455.50.

CONTRA COSTA COUNTY—On Tunnel Road at Upper Happy Valley Road and Acalanes Valley Road, channelization to be constructed and highway lighting system to be furnished and installed. District IV, Route 75, Section A. J. Henry Harris, Berkeley, $30,422. Contract awarded to O. C. Jones & Sons, Berkeley, $29,362.40.

KERN COUNTY—Between Scale House and Oak Glen, about 2.2 miles to be surfaced with plant-mixed surfacing over existing Portland cement concrete pavement and perforated metal pipe underdrains to be installed. District VI, Route 4, Section A. Schroeder and Company, Sun Valley, $52,702; Dicco, Inc., Bakersfield, $54,045. Contract awarded to Griffith Company, Los Angeles, $50,420.

KERN COUNTY—Portions between 4.4 miles east of San Luis Obispo county line and 5.6 miles west of Maricopa, about 1.6 miles in net length, to be graded and surfaced with road-mixed surfacing on cement treated base to provide a four-lane highway. District VI, Route 57, Section A. Nappe Construction Co., Inc., North Hollywood, $161,120; Clyde W. Wood & Sons, Inc., North Hollywood, $163,357; Granite Construction Co., Watsonville, $166,199; John Delphia, Patterson, $181,463; M. J. B. Construction Co., Stockton, $188,675; M. Malfitano & Son, Inc., Pittsburg, $190,914; Madonna Construction Co., San Luis Obispo, $256,113. Contract awarded to Hermreck & Easter, Santa Maria, $149,837.90.



Annual luncheon given by California State Chamber of Commerce to California Highway Commission and staff on July 17, 1952. *Left to right, standing:* John Hislop, District Manager, State Chamber of Commerce, Fresno; Edward Sipe, District Manager, State Chamber of Commerce, Stockton; Clark Galloway, District Manager, State Chamber of Commerce, Los Angeles; H. Sprenger, Road Commissioner, Orange County, Santa Ana; Robert M. Shillito, Assistant General Manager, San Francisco Chamber of Commerce; Dudley Frost, Vice Chairman, Alameda County Highway Development Committee, Oakland; Vince Cooper, Assistant Manager, County Supervisors Association, Sacramento; Clarence Breuner, Regional Vice President, State Chamber of Commerce, Sacramento; William Sparling, General Manager, Oakland Chamber of Commerce; Wallace Boggs, County Surveyor, Alameda County; Frank H. Mogle, Chairman, California Major Highway Development Committee, San Bernardino; A. J. Vanderschoot, Member Highway Committee, North Coast Council, State Chamber of Commerce, Santa Rosa; William J. Tunison, Chairman, Sacramento Valley Council Highway Committee, Westwood; Claude Faw, Chairman, Central Coast District Highway Committee, San Francisco; A. H. Clark, Vice Chairman, Central Coast Highway Committee, Soledad; Charles Erhorn, Vice Chairman, San Joaquin Valley District Highway Committee, Visalia; Chester W. Walker, Vice Chairman, Sacramento Valley Council Highway Committee, Hamilton City; Irving Symons, Chairman, Central Valley Highway Committee, Sonora; Chas. E. Waite, Assistant State Highway Engineer; Frank Forward, Chairman, Southern California District Highway Committee, San Diego; F. W. Panhorst, Assistant State Highway Engineer; Robert Reed, Chief, Division of Contracts and Rights of Way, Department of Public Works; Lou Arnold, Administrative Engineer, Los Angeles; E. E. East, Chief Engineer, Automobile Club of Southern California; J. W. Vickery, Assistant State Highway Engineer; Harmer Davis, Director, I. T. & T. E., Berkeley; J. C. Womack, Planning Engineer, Division of Highways.

Left to right, seated: Walter Hogan, Consulting Engineer, Stockton; F. H. Gibson, Chairman, Board of Supervisors, San Diego; Sam Kennedy, Road Commissioner, Los Angeles; "Cass" Kennedy, Secretary, California Highway Commission; Chester H. Warlow, Highway Commissioner, Fresno; Harrison R. Baker, Highway Commissioner, Pasadena; Milo Bekins, Chairman, State-wide Highway Committee, State Chamber of Commerce, Los Angeles; Frank B. Durkee, Director of Public Works and Chairman, California Highway Commission; F. Walter Sandelin, Highway Commissioner, Ukiah; H. Stephen Chase, Highway Commissioner, Sacramento; R. H. Wilson, Assistant State Highway Engineer; R. M. Gillis, Deputy State Highway Engineer.

Harbor Freeway

Continued from page 58 . . .

maintenance equipment to wash the pavement and sprinkle it to keep down dust, and also furnished stand-by fire department apparatus for instant use in the event an emergency developed.

Landings were made by 10 helicopters, arriving two at a time and landing side by side on the two strips of pavement. Each helicopter carried five or six passengers, and landings were directed from the ground by radio control. As is the case with everything the U. S. Marines do, the landings were carried out very expeditiously and efficiently without even the slightest kind of an accident marring the occasion.

It should be pointed out that the only reason it was possible to make this freeway pavement available for helicopter landings was because of the strike conditions that had tied up all freeway and highway construction work in this area.

Had it not been for the shut-down of work caused by the strike, the contract on the Harbor Freeway for grading and paving between Temple Street and Fourth Street would have been completed and this section of freeway would have been opened to public traffic.

CORRECTION

Two photographs were inadvertently transposed in the article on Erosion Control, by H. Dana Bowers, pages 23 and 24, May-June issue of *California Highways and Public Works.*

The picture of the slope above an old road at the bottom of page 23 belongs under the caption at the bottom of page 24, and vice versa. The captions are in their correct places.

Cost Index

Continued from page 57 . . .

projects do not appear to attract the competition that obtains for the larger jobs, as work under $50,000 averaged only 4.5 bidders per letting while jobs from $500,000 to $1,000,000 averaged 6.7 and projects over $1,000,000 averaged 7.0 bidders for each bid opening.

The last two lines in the tabulation of average bidders, which show a comparison of the breakdown by months for each of the last two fiscal years, present interesting information on the seasonal aspect of bidding by highway contractors.

The accumulation of data and preparation of the California Highway Construction Cost Index appears to indicate that we enter the third quarter of 1952 poised in a state of suspense, with trends in the cost of construction pending the settlement of many and diverse economic and political factors. The next six months should see a definite trend established and there appears no firm assurance that it will be downward.

CALIFORNIA DIVISION OF HIGHWAYS

Number and Size of Projects, Total Bid Values and Average Number of Bidders
(July 1, 1951, to June 30, 1952)

Project volume	Up to $50,000	$50,000 to $100,000	$100,000 to $250,000	$250,000 to $500,000	$500,000 to $1,000,000	Over $1,000,000	All Projects
Road Projects							
Number of projects	120	38	70	28	15	11	282
Total value (bid items)	$2,692,758	$2,836,211	$11,273,888	$9,315,037	$10,443,407	$17,064,964	$53,626,265
Average number bidders	4.4	5.4	5.3	5.2	6.3	6.5	5.0
Structure Projects							
Number of projects	39	19	13	12	5	5	93
Total value (bid items)	$815,457	$1,364,296	$2,321,039	$4,458,008	$3,297,076	$7,513,519	$19,769,395
Average number bidders	4.8	5.7	7.1	6.4	7.6	8.6	5.9
Combination Projects							
Number of projects	---	---	---	---	---	9	9
Total value (bid items)	---	---	---	---	---	$18,539,234	$18,539,234
Average number bidders	---	---	---	---	---	6.9	6.9
Summary							
Number of projects	159	57	83	40	20	25	384
Total value (bid items)	$3,508,215	$4,200,507	$13,594,927	$13,773,045	$13,740,483	$43,117,717	$91,934,894
Average number bidders	4.5	5.5	5.6	5.6	6.7	7.0	5.3

Total Average Bidders by Months

	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	Year
Last year	4.3	4.0	4.6	4.4	8.0	7.3	7.6	6.4	6.9	6.0	4.5	4.8	5.3
This year	4.9	5.6	5.8	6.2	6.7	5.7	5.5	5.3	4.8	4.7	3.7	3.2	5.0

Successful Tour

Continued from page 54 . . .

future requirements. He shall also design and construct all projects so that later expansion by additional traffic lanes, and other facilities, would be on presently acquired rights of way. In this way all economic disturbances incident to possible future reroutings would be eliminated, insofar as humanly possible.

We pointed out that the commission acknowledges its responsibility to allocate initially the necessary funds to facilitate the probable ultimately required expansions, and that we were building the California highways upon this basis.

Appreciation

The presentation thus made to the people, and their delineation of projects they considered of prime importance to their communities, constituted an exchange of facts that all considered mutually beneficial, and in the general public interest.

On the morning of June 17th, the members of the official party left Bakersfield for their respective homes, each convinced that every purpose of the trip had been accomplished.

On behalf of the members of the California Highway Commission, and of the Division of Highways, it is my pleasure to express our appreciation for the opportunities afforded for renewing old friendships, and acquiring many new friends. We are especially grateful to the Chambers of Commerce of Merced, Madera, Hanford, Porterville, Lindsay, Tulare City, Tulare County, Visalia, Woodlake, Fresno, and Kern, and to the Regional Council of the California State Chamber of Commerce, for their cooperation and assistance in arranging the tour and the details of the various meetings, for their several hospitalities, and for their brief, yet explicit, presentations of their highway problems.

We were thus able to accomplish much in a very short time. We also express our appreciation to the Rotary Club of Fresno for devoting its Monday meeting to our highway business; and to Evind Scoyan, Suptrintendent of Sequoia and Kings Canyon National Parks, and to George Mauger, Manager of the Park Company, for their personal attention and courtesies on our Sunday "off-day," which was primarily devoted to the pleasures of existence in California's scenic Sierra.

All in all, our travels and our sojourns were exceedingly pleasant and highly beneficial, a happy combination of business and pleasure, which, in life, is always highly satisfactory.

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Governor of California

•

FRANK B. DURKEE
Director of Public Works

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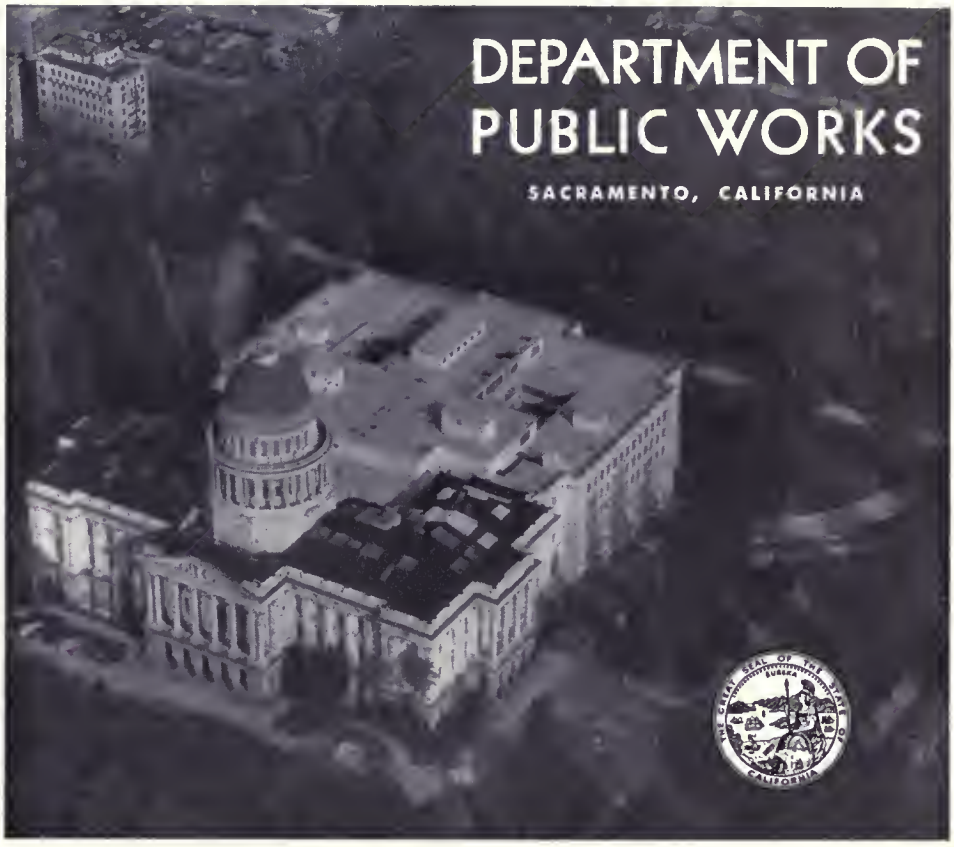
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Contour Grading Highway Maps

Their Use in Mountain Terrain Is Successful

By C. V. KANE
District Highway Engineer *

THE VOLUME of earthwork—both excavation and embankment—for practically all highway construction projects is determined during the design stage. This volume is used to ascertain the balance between excavation and embankment and as an estimate of quantities for comparing bids for contract work. The quantity determined at that time may or may not, depending on job conditions, be used as final pay quantities. Earthwork volume is determined by what is known as the cross-section method. The routine is for survey parties to take ground elevations across the proposed roadbed at intervals of about 50 feet throughout the length of the job.

After these elevations are plotted by draftsmen to scale in the office, the finished construction section proposed (a template when feasible) is superimposed, and the area between the two lines determined as a basis for volume calculation by the "average end area" method. The same ground is again covered by a construction survey staking party. In mountain work the method is laborious, and in all cases is time consuming for both field and office forces. This is especially true since the advent of the freeway. Mathematically, the "average end area" method of calculations is not exact. The error is accumulative and is represented by the prismoidal correction, which for convenience is not usually made. This fact is recognized and stated in grading contracts to avoid disputes. Cross-section sheets included in highway construction plans are bulky and voluminous. This article deals with results of a limited scope effort to streamline and speed up this operation by substituting a contour grading plan for the cross-section method.

* Mr. Kane wrote this article while he was Assistant District Engineer in District VIII. In August of this year he became District Highway Engineer in District 1.

CONTOUR GRADING PLAN FIRST USED BY LOCATION ENGINEER

Contour maps have been extensively used by location engineers to determine alignment and grade prior to staking the line on the ground where the position is controlled generally by the contour of the terrain. This condition always exists in mountain work and oftentimes in "rolling" terrain. When establishing the City Creek Road location in San Bernardino County in 1944 to high standards through rugged mountain terrain excellent contour maps were available. The earthwork quantities were very large for a two-lane facility and any shift of the line for only a few feet would change excavation and embankment quantities by large amounts and, therefore, for reasons of construction economy, close study was given several trial lines before establishing the one to use on construction plans. Various methods have been used in the past for determining earthwork quantities on trial lines by the use of contour maps. The shortcomings of these methods were either lack of accuracy or the time consumed to produce accuracy.

Recognizing the deficiencies of the usual highway and railroad methods, District VIII borrowed from landscape and hydraulic engineers the method of preparing a grading plan by superimposing contour lines of the proposed construction on the existing contour map. By this method earthwork quantities on trial lines were quickly and accurately determined.

Subsequently, the contour grading plan method has been used as routine in District VIII for establishing locations in mountain and rolling terrain. This practice has resulted in saving time and has produced accuracy and economy of design.

CONTOUR GRADING PLAN USED FOR CONSTRUCTION PLANS

Modern highway design was generally first practiced by railroad engineers who adapted railroad methods, handbooks, etc., to highway needs. Until recent years the highway roadbed, like the railroad, was generally narrow and had uniform widths and uniform excavation and embankment slopes. This uniformity of section made possible easy design and calculation of earthwork by the cross-section method. By reason of the extreme uniformness of the roadbed, railroad practice was usually able to eliminate the step of plotting the cross-section and performed the calculations directly from the field survey notes. Actually, the field work combined the operations with slope staking.

Highway practice, on the other hand, by reason of a somewhat wider section and some less uniformity of width and slopes coupled with necessities of public contract work, established the practice of plotting the cross-sections for purposes of design and calculation of earthwork quantities. Construction stakes are then placed by a subsequent survey operation. Evolvement of the freeway principle greatly changed the picture as to widths and slopes. A single roadbed was replaced with a double one, often on different levels and separated by a varying width median. Many significant roadbed safety appendages were added to reduce the "friction" produced by high volume and high speed vehicular flow. The "appendages" are "bulb" connections, speed change lanes, channelized intersections, interchanges, frontage roads, etc. In addition, excavation and embankment slopes of variable pitch and warped surfaces have come into use to produce a more pleasing appearance and to reduce erosion. These variable features

produce a construction cross-section that is far more complicated than the simple railroad section for which the cross-section method was so well adapted.

Contour Grading Plan

The contour grading plan for design and calculation of earthwork appears well adapted for application to the variable features of freeway design. District VIII has used it successfully for interchange construction plans for several years. It was also used for one six-mile project, the plans for which originally were prepared for day labor work, but subsequently let to contract. Later a mountain channelization project was constructed from a contour grading plan. This experience has revealed no engineering or construction difficulties.

bankments, and all other parts of the design. Its application to odd-shaped construction, such as intersections, either channelization or interchange, is readily apparent. For such use, the contour grading plan affords an especially easy method of designing the drainage system, determining earthwork quantities, and designing rounded and warped surfaces between roadbeds necessary for pleasing landscaping. It is somewhat impracticable at interchanges to use the cross-section method for either design or construction slope staking. Grading contours can be staked on the ground to control the work. From the standpoint of the contractor and the construction engineer, many advantages are self-

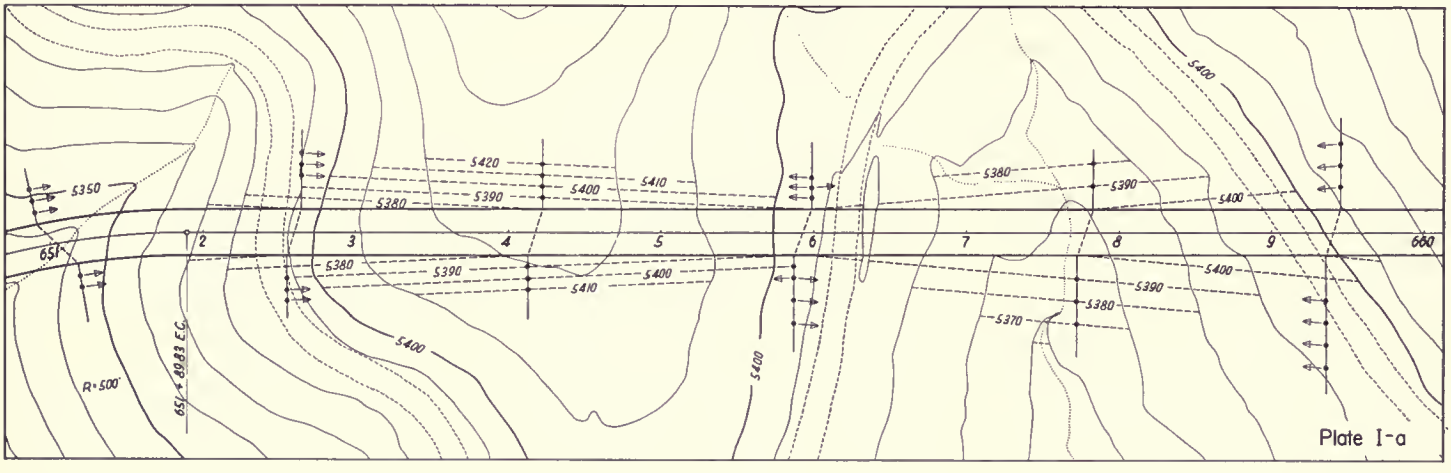
DRAFTING THE GRADING CONTOUR PLAN

Plate I-a—Plot highway center line and shoulder line control on the contour map. Determine position of grading contour crossing of roadbed. (Crown) Set up guides for controlling position of successive grading contours falling on cut or fill slopes. Draw in the grading contours which will terminate at the original ground contours of the same elevation and form closed contours.

Plate I-b—Connect grading contour terminal points by irregular line which represents toe of cut and fill slope.

COMPUTING EARTHWORK QUANTITIES (Approximate Method)

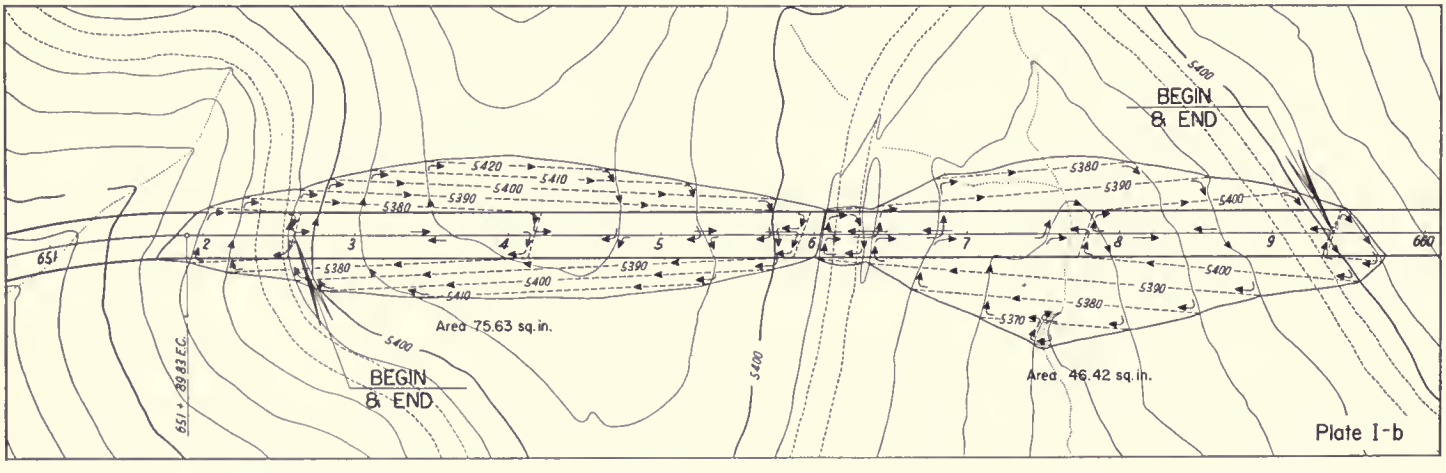
The areas bounded by the closed contours are determined. Volume is then taken from the average contour



The contour grading plan in effect is a three-dimensional view of the proposed construction, correlating alignments, profiles, drainage facilities, structures, limits of excavation and em-

evident in that a three-dimensional plan of a large portion of the work can be viewed on a single sheet in lieu of having plan and profile on one sheet with cross-sections on additional sheets.

areas as illustrated on *Plate I-c* profile. *Plate I-b* also illustrates method of accumulating contour areas by using the planimeter as an adding machine. Each closed contour is planimetered and in



a continuous operation is shifted to successive contours along centerline and thence back to point of beginning as illustrated by arrows. A planimeter reading is then taken. Reduction to earthwork volume is made as shown in sample calculation for entire length of excavation or embankment.

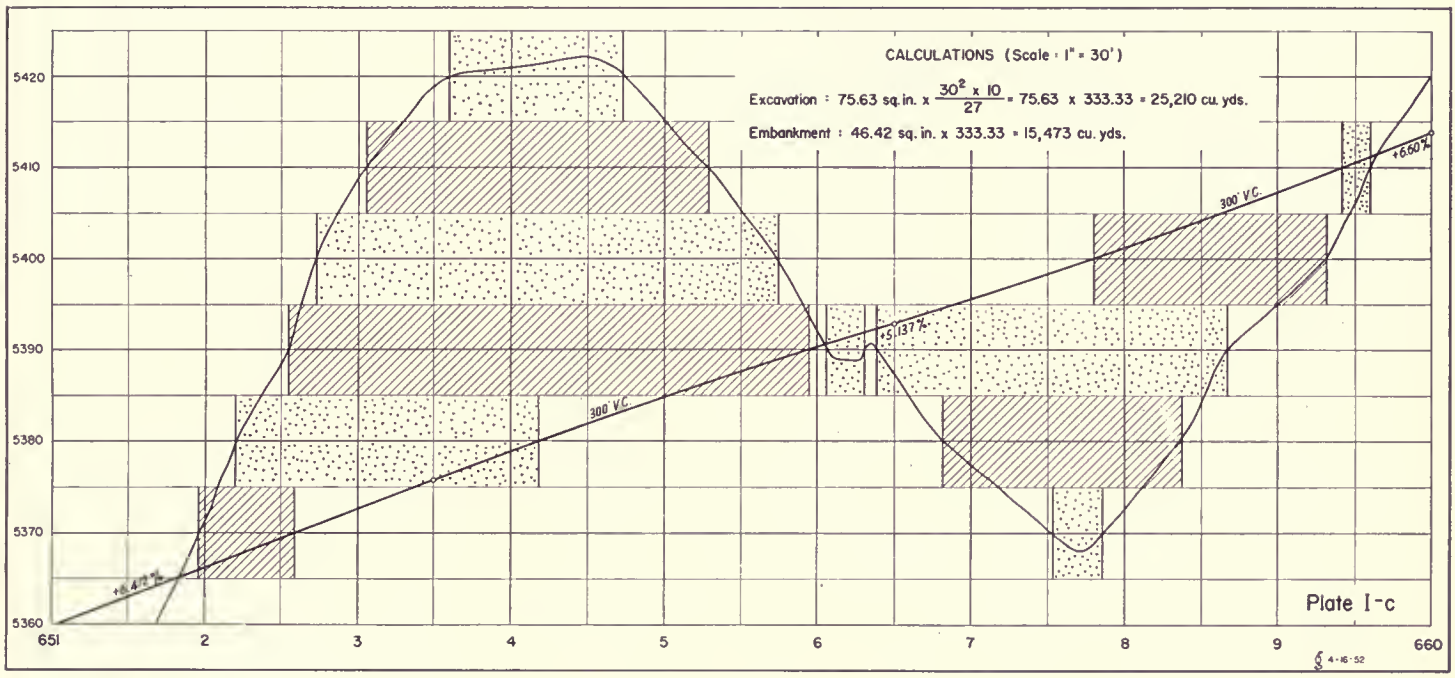
The data shown here indicates an error of 6.9 percent when the approximate method is compared with that of cross-sections taken from the same contour map. Comparison with field cross-sections indicates an error of 4.4 percent. The method neglects partial contour intervals.

station division. This method supplies a more rational approach and would more nearly conform to present practice of determining earthwork quantities as a pay item for contract work and facilitates conventional construction of the mass-haul diagram.

For purpose of illustration, sample calculations are shown. In order to clarify the process, all of the contour plane areas involved between Station 654 and Station 655 are shown as separate crosshatched areas. To assist in visualizing the process, a perspective sketch with separated sections is also shown. Calculations are illustrated in

Contour Method for Calculating Earthwork

The use of the contour method for calculating earthwork, where it is necessary to know the volume between each station, is not generally recommended, because, as illustrated in the perspective sketch, there is likely to be a large number of areas involved. Note that it is necessary to insert additional areas at points of abrupt change in prism outline, such as at elevation 5,385 and 5,414 in the illustration. In practice, the station-to-station method might be dispensed with and divisions of length used that would conform to abrupt changes in profile of the



The approximate method is usually satisfactory for projection work or trial runs of quantities. Its advantage is the great speed by which results can be obtained.

COMPUTING EARTHWORK QUANTITIES (Precise Method)

Plate II (see page 4) illustrates the method of calculating earthwork quantities taking into account partial contour intervals that will usually exist, in lieu of ignoring them as was done in the approximate method set forth above. Also it illustrates the method of obtaining quantities of any portion of the whole cut or fill such as the station-to-

table labeled "Sample Calculations." It is to be noted that the contour plane areas involved are simple trapezoids in four cases out of the seven areas involved. These areas might be determined by calculations using scaled dimensions instead of using a planimeter. In calculating the volume of excavation in cubic yards, when "Distance 'D' " contains a series of contour intervals which are constant, areas can be combined by applying the formula $S = A_1 + 2A_2 + 2A_n\ (n + 1)$, where A_1 is the first area involved, A_n is the next to the last area involved and A_{n+1} is the last area in the series.

ground. This would satisfy mass-haul diagram and pay quantity requirements even though present practice would be altered.

The following tabulation of calculations was prepared for comparative purposes by expanding existing work data for a 2,100-foot section of a mountain highway design. The section was selected at random after the project was completed. The contour map was made by the stadia method for the purpose of fixing the location. The scale was 1 inch = 50 feet. Cross-sections were made from the contour map and included in the construction plans. The field cross-sections were taken at the time of slope staking the project

EARTHWORK VOLUME (IN CUBIC YARDS) BY SEVERAL FIELD AND OFFICE METHODS

Station to station	Excavation: Contour plan, Av. level areas	Excavation: Contour plan, Prism corr.	Excavation: X-sections from contours, Av. end areas	Excavation: X-sections from contours, Prism corr.	Excavation: Field X-sect., Av. end areas	Embankment: Contour plan, Av. end areas	Embankment: Contour plan, Prism corr.	Embankment: X-sections from contours, Av. end areas	Embankment: X-sections from contours, Prism corr.	Embankment: Field X-sect., Av. end areas
651+80 — 656+02	24,039	23,994	23,452	23,299	23,632	———	———	———	———	———
656+02 — 659+62	———	———	———	———	———	14,989	14,905	14,603	14,385	15,343
659+62 — 662+80	8,116	7,910	7,814	7,643	7,970	———	———	———	———	———
662+80 — 664+25	———	———	———	———	———	2,424	2,382	2,394	2,376	2,628
664+25 — 668+50	6,320	6,184	5,990	6,113	5,932	———	———	———	———	———
668+50 — 672+45	———	———	———	———	———	30,111	29,590	30,354	30,071	31,582
Totals	38,475	38,088	37,256	37,055	37,534	47,524	46,877	47,351	46,832	49,553

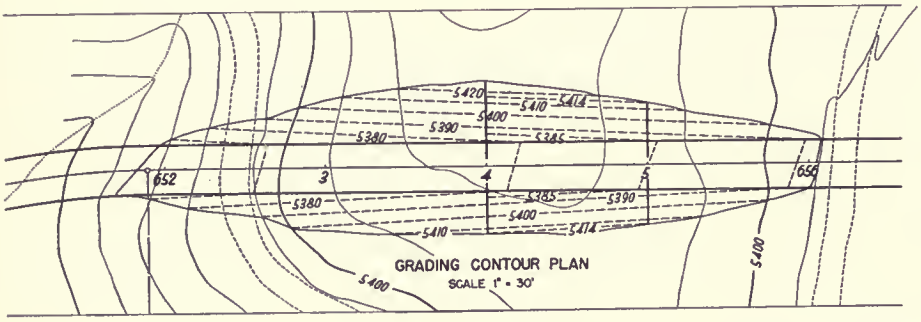
for construction to determine the contract pay quantity of earthwork.

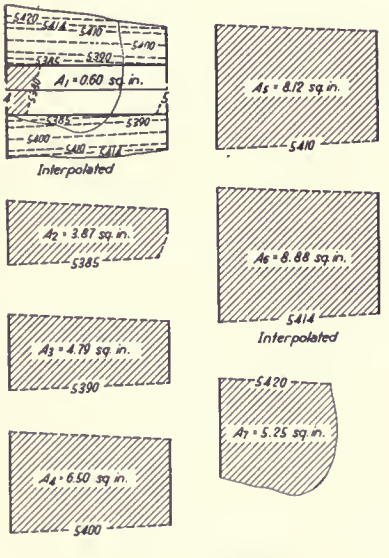
Test of Correctness

A test of the mathematical correctness of the contour grading plan method of obtaining earthwork quantities would be a comparison between the quantities as shown under "Contour Plan" as against those as shown under "X-Sects from Contours" because the same field data was used. In this instance the average discrepancy without prismoidal correction is 1.7 percent with a maximum of 2.7 percent.

Prismoidal corrections were made to the above quantities to reduce them to more exact figures so that the effect on each system could be compared. The results appear to be rather uniform with an average correction of —1.2 percent for the contour method and —0.8 percent for the cross-section method.

Comparison of the grading contour plan method with the field cross-section method indicates that there is an average discrepancy of 0.5 percent, with a maximum of 7.7 percent. This comparison is more of a test of discrepancy between the field methods





CONTOUR PLANE AREAS

SAMPLE CALCULATIONS

STA. 654 to STA. 655

Contour	Area Sq. In.	Sum Area "S"	Distance "D"	Volume* Cubic Yards
5378	0.00	0.60	2	20
5380	A_1 = 0.60	13.13†	5	1094
5385	A_2 = 3.87		5	
5390	A_3 = 4.79	25.91	10	4318
5400	A_4 = 6.50		10	
5410	A_5 = 8.12	17.00	4	1133
5414	A_6 = 8.88	19.38	6	1938
5420	A_7 = 5.25		6	
5426	0.00		Total	8503

NOTES

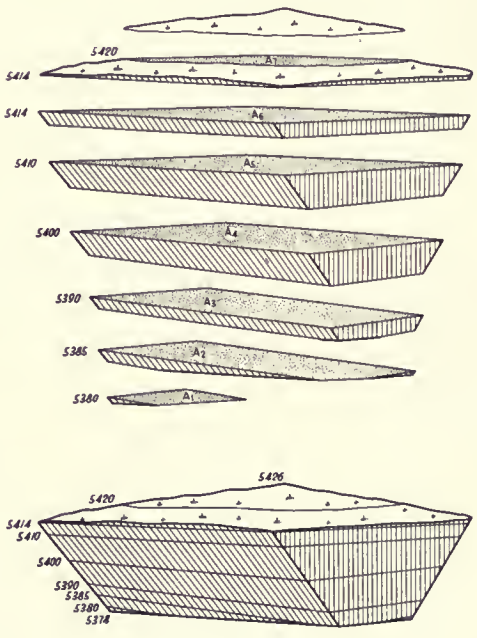
*Volume = S x D x C

†S = Sum Area. Where "D" is constant for two contour intervals, $S = A_1 + 2A_2 + A_3$

D = Distance between contours.

C = Constant = $\frac{M^2}{2 \times 27} = \frac{30^2}{54} = 16.667$

M = Map Scale = 30 in this case since 1 inch = 30 feet.



PERSPECTIVE SKETCH
WITH SEPARATED SECTIONS

Plate II.

than it is of the method of calculation. The two field surveys were independent and were not compared and reconciled prior to making the calculations.

The preferred practice in obtaining quantities from contour maps, especially if pay quantity is anticipated, would be to run one or more profiles for checking and correcting the contour map. The largest discrepancy observed here obviously resulted from a difference in the field surveys. It is not known which survey was in error. Preliminary results here indicate that earthwork quantities calculated by the precise method from a contour grading plan should not be questioned as to accuracy if the contour map has been checked in the field.

Saving in Time

A time study was made on a 3,300-foot section of the City Creek mountain highway. It was found that a 40 percent saving in man-hours resulted from the use of the grading contour plan over the conventional cross-section method. This ratio includes the field time in making the contour map, cross-sectioning the excavation sections at the time of slope staking and calculating the pay quantities from the cross-sections. This control test was of limited scope and might be representative of work in this type of terrain only.

SUMMARY

The following conclusions are based on limited application of the contour grading plan in District VIII. It is not to be construed that they are intended to be conclusive, but rather an indication that the method has sufficient merit for further study and examination of the many attendant matters that would be affected by elimination of cross-sections from a portion of highway contract work.

Advantages of the Grading Contour Plan

1. It is estimated that earthwork calculations, together with attendant drafting and survey operations can be accomplished with a saving in man-hours of about 40 percent.
2. Culvert location, length, and skew can be accurately and easily determined. The entire drainage system is presented by a clear and comprehensive picture.
3. Design and calculation of earthwork and construction staking at interchanges with warped cut and fill slopes coupled with roadways intersecting at odd angles would be materially improved.
4. It is ideally suited for full advantage adaptation to aerial photogrammetry. Surveying by photography is rightfully coming into general use and unquestionably is the key to speeding up highway construction plans to keep pace with expansion of highway construction programs.
5. It sharply reduces number of drawings included in a set of highway construction plans.

Possible Practicable Application of the Grading Contour Plan

1. Approximate method of computing earthwork is ideally adapted to projection work to determine final line and grade for mountain locations. Its use for the same purpose in rolling terrain is often advantageous.
2. Precise method of computing earthwork (without division by station) is preferable for plan work even though pay quantities are to be obtained by cross-sections taken during construction.
3. Scale for contour grading plans should preferably not be less than 1 inch = 50 feet. Scale at interchanges where staking might be performed by scaling should be 1 inch = 20 feet.
4. Contour interval for mountain terrain can be 10 feet. Contour interval for rolling terrain can be 5 feet. Contour interval for flat terrain can be 1 foot to 2 feet. It is not always practicable with photogrammetric methods to make different contour intervals on original map to conform to changes of terrain. Additional contours can be added by interpolation and with field assistance when justified.
5. Grading contour plans could supplement usual construction layout plans or in some instances could be superimposed on the plan and profile sheets.
6. Until such time as more experience has been had with earthwork quantities, it would seem preferable to use grading contour plans generally for the purpose of preliminary estimate only. An exception might be made at interchanges when it is rather impracticable to use cross-sections. These applications appear in conformance with Standard Specifications. Excavation pay quantities could be obtained from cross-sections taken at the time of slope staking a project. It usually should not be necessary to cross-section embankment areas.
7. A suitable mass-haul diagram can be obtained by dividing quantities in a cut and fill at occasional critical points.
8. Contour grading plans would not be of any benefit for "scratch" grading jobs. Here some form of lump sum grading item has economy advantages.

ACKNOWLEDGMENT

Full credit for any value this contour grading plan method may prove to have belongs essentially to two District VIII engineers who, without known precedent, developed it. In 1944 L. Maynard Goode, then assistant location engineer, established the routine of drafting the construction contours for purposes of determining limits of grading. By logical sequence, he then began taking off earthwork quantities by the approximate method to assist in establishing mountain locations. In 1946 when preparing construction plans and incorporating contour grading plans, District Design Engineer L. D. Wanée developed the precise method of computing earthwork quantities.

CALIFORNIA LEADS IN GASOLINE TAX PAYMENTS

Highway users in California paid more than $209,500,000 in state and federal gasoline taxes during 1951-1952 Fiscal Year, the highest of any state, the California State Automobile Association reports. Of this record amount, more than $149,500,000 was paid to the State through California's 4½-cent tax, and about $60,000,000 to the Federal Government. On November 1, 1951, the federal gasoline tax was increased from 1½ to 2 cents per gallon.

Festival of Arts

Construction in Laguna Canyon Did Not Interfere With It

THE Nappe Construction Company contract to widen and improve State Highway Route 185 in Laguna Canyon is nearing conclusion, being 95 percent complete, and the City of Laguna Beach is winding up its summer season, having concluded a very successful presentation of the annual Festival of Arts. To those not familiar with the local scene, the connecting link between the state highway project and the City of Laguna Beach Festival of Arts will not be apparent, and it is the purpose of this story to explain that connection.

Festival of Arts

For years prior to the construction of the Coast Highway, the Laguna Canyon Road, 10 miles in length from U. S. 101 to the coast, was the only road serving the art colony and summer resort known as Laguna Beach. It has played an important part in the growth and development of the City of Laguna Beach. During the last war it served as the main highway from the El Toro Marine Base, located inland some 12 miles, to officers' quarters established in the Laguna Beach Hotel and the residences of officers, enlisted personnel, and civilian workers in Laguna Beach. On this highway near the easterly city limits of Laguna Beach, on the Irvine City Park grounds, is the present home of the world-famous Festival of Arts.

THE LAGUNA BEACH POST

September 10, 1952

We who were concerned when the strike held up completion of the Laguna Canyon Freeway just before our annual Festival of Arts opened in late July have reason to praise the cooperation given by the State Highway Department. As a result possibly disagreeable factors were avoided, such as traffic snarls, dust and dirt. In fact, conditions were generally better than they have ever been, which may explain in part why the season was the most successful in Festival history.

GLEN INGLES
Editor

As the City of Laguna Beach grew in size to its present estimated permanent population of 8,000, traffic on this state highway increased so that widening improvement became very necessary. Before this project was started, the local people expressed considerable apprehension as to the effect the construction might have upon the success of their summer season, and particularly the Festival of Arts. Local people were assured that the State Division of Highways would do everything possible to see that the highway construction did not seriously interrupt the summer activities of Laguna Beach.

Artists' Colony

The Laguna Beach Festival of Arts is very dear to the hearts of the local people. The Festival of Arts idea was born in the early thirties, when Laguna Beach was a very small village by the sea. The natural beauties of the coast line, with its backdrop of rolling hills and canyons, lured artists to the quaint spot and, of course, they painted many pictures. In the early days, these artists

Looking westerly from Woodland Drive along completed State Highway construction in Laguna Canyon. City of Laguna Beach and Pacific Ocean in background.





Looking westerly from Conyon Acres Drive, showing completed highway construction with recently planted mesembryanthemum cuttings in the central dividing strip

displayed their paintings during midsummer on the fences in El Paseo Alley near the ocean front and held dances in the street to draw customers. From this spontaneous start the Festival of Arts came into being, and in 1933 the first presentation was made of living pictures. This started the festival in its present form.

The following year the Festival of Arts Association was formed by Laguna residents to encourage the artistic and cultural pursuits of the community. Several years later the festival found a permanent home when the property now known as Irvine Bowl was acquired. Since that time, omitting the war years, the Festival of Arts has flourished until it has become not only a significant Laguna institution, but a nation-wide attraction.

Successful Season

The 1952 presentation, being the seventeenth annual season of the Festival of Arts, was unusually successful, in spite of the highway construction work going on at its front door. It is reported that for the season just closed the living pictures, the lighting, the timing, the music, the attendance, the exhibit booths, and the sales by exhibitors all were better than ever before. There were more than 50,000 paid admissions to the 1952 Festival of Arts. According to the record, people came from 38 states and from eight foreign countries.

The Festival of Arts thrives in Laguna Beach on the strength of an eager community spirit. People from all walks of life and of all ages enter into the work with enthusiasm. This year over 700 volunteer workers participated in the cast and the crew necessary for carrying out the Festival of Arts activities. Under the able leadership of the Rev. Philip E. Gregory, the Neighborhood Congregational Church, as in previous years, operated the food concession where home-cooked, full-course meals, as well as light snacks, were served on the festival grounds.

McCulloughs Give Generously

Among the many volunteers who have given so generously of their time and services to further the Festival of Arts are C. J. (Slim) McCullough, his wife, and three daughters. McCullough, who is the Resident Engineer for the Division of Highways on this Laguna Canyon construction project, and his family first established their home in Laguna Beach in 1932 so that McCullough could be close to state highway construction work in Orange County.

In 1935 Mr. and Mrs. McCullough started their participation in the activities of the Festival of Arts. In 1936 Mrs. McCullough had charge of properties and McCullough acted as stage manager for the Festival's Pageant of the Masters, which is the presentation of the living pictures. This year marked the first presentation of Leonardo da Vinci's "The Last Supper." This presentation was truly a stupendous undertaking and its immediate success set the pattern for the future living pictures in the Pageant of the Masters. In all subsequent presentations of these living pictures, the showing of "The Last Supper" has been the final number on every program.

McCullough Girls Pose

Throughout the years the McCullough family has continued to take an active part in the Pageant of the Masters presentations. All three daughters have appeared in the living pictures. Gloria for many years posed in "The Gleaners," by Millet; Sheila posed in "Lady and Gentleman Drinking Wine," by Vermeer; and Caroline took part in "On the Dyke." McCullough continued as stage manager through 1941, when presentations were



Irvin Bowl open air theater at Laguna Beach during Pageant of Masters, showing illumination of Art Festival grounds. Photo by Larry Kranquist

interrupted by the war. When showings were resumed in 1946, McCullough's work with the State Division of Highways required him to be on a construction job in Stockton and this forced him to give up his position as stage manager.

Mrs. McCullough has continued with the festival activities of later years in the capacity of librarian and executive secretary. In issue of *The South Coast News* of July 25, 1952, there was reported concerning Mrs. McCullough's activities the following:

"Among her many 'jobs' the one she enjoys perhaps the most is that of pageant librarian. In that capacity she searches out prints of the masterpieces to be staged as living pictures. Sometimes her search leads her into by-ways, as when she was looking recently for a *Saturday Evening Post* cover by Norman Rockwell. 'The one we needed this year was a cover he had painted in 1938,' she said.

" 'Years ago I used to go up to Los Angeles to a store on Main Street that specialized in old periodicals. It was fun to go through back issues, and finally to find just the print for which we had been searching. This year's Rockwell, known on the program as "Sweet Adeline," was to be found only in New York, strangely enough also at a periodical dealer's. The copy they sent us, incidentally, was the only one they had.'

"She spoke also of correspondence with art galleries all over the United States and in several foreign countries in search of needed prints. 'We received one from the Louvre and one from the Mauritshuis Art Gallery in The Hague, Holland, for this season's production. Everywhere we sent inquiries, the persons in charge were most helpful. If they couldn't supply us with the necessary print, they could often refer us to another gallery or dealer who could'."

Public Agencies Cooperate

The successful consummation of state highway construction in Laguna



Live models pose for reproduction of Da Vinci's famous painting, The Last Supper

Here again artists pose for Shepherds of Arcadia, by Nicolas Paussin





Models faithfully bring to life Marcellus and the Princess by Dean Carnwell. Photo by Susan French, Santa Monica.

Canyon is due to the wholehearted cooperation of public officials and citizens of the City of Laguna Beach and the Orange County Board of Supervisors, Road Department, and Flood Control Department with the State Division of Highways. During the designing of this highway project, many visits were paid to the State Highway District Office in Los Angeles by Mayor Frank Wharton and City Engineer Craig Leland of the City of Laguna Beach, Orange County Supervisor Heinz Kaiser, County Road Commissioner Harold Sprenger, County Flood Control Engineer Jack Bradley, and many others.

It developed very early in the design stages that it was necessary for flood control construction to be carried out by the county simultaneously with the highway work by the State, and plans were developed to that end. The construction work by Orange County on the storm water channel in Laguna Canyon is now nearing completion, all concrete being placed and ready for backfill and fencing.

Problems of Right of Way

There were many problems that developed in connection with right of way acquisition. Unfortunately, the proposed widening of the state highway required the taking of land on the southerly side of the canyon to such an extent that a small industrial district had to be entirely wiped out. The property in the City of Laguna Beach and in Orange County area zoned for industry is very limited, and it was only by cooperation of the Orange County Planning Commission and the City of Laguna Beach Planning Commission that details were worked out so that new sites could be developed for the industries which the State was forced to have removed.

A total of 48 parcels were needed for right of way and these areas were all acquired by negotiation between State Division of Highways right of way agents and the property owners. With such difficult and complicated right of way situations as existed, it is indeed remarkable that in no case was it necessary for the State to resort to the drastic procedure of condemnation proceedings.

It was originally hoped to let the contract in the fall of 1951, but so many details had to be worked out that it was not possible to award the contract until January 7, 1952, at which time McCullough was assigned as Resident Engineer. McCullough is one of the "Old Timers" in District VII, having first come to work in this district in 1924 as an assistant resident engineer on construction of the Coast Highway through Encinitas. Since then he has been resident engineer on many important state highway construction projects. Recently he was resident engineer on the Piru Gorge section of the Ridge Route reconstruction, coming from there to the Laguna Canyon project.

McCullough and his two Assistant Resident Engineers, John F. Smith and William E. Brown, were fully aware

CITY OF LAGUNA BEACH, CALIFORNIA
J. Frank Wharton, Mayor

September 8, 1952

Department of Public Works, Division of Highways
Los Angeles, California

Gentlemen: Now that the new highway work is completed, I wish to express the appreciation of the City of Laguna Beach for the wide highway which makes a beautiful gateway to our community. The design and realignment of the old right of way has enhanced the usefulness of the city park facilities and added materially to the value of the adjoining property.

We especially wish to commend the personnel of the various departments of the highway for their cooperation and understanding of the city's problems, starting with the land purchase, which was equitable, and arranging for the convenience of our citizens, down through the construction of the project in which all consideration was given so as not to interfere with the functions of the city in carrying out its services.

We have enjoyed the contact with the Resident Engineer, Mr. McCullough, and assure you that he has made many friends for the Highway Department.

Very truly yours,

J. FRANK WHARTON
Mayor

Lot and His Family Leaving Sodom. Painting by Rubens. Artists give it life. Phota by Susan French, Santa Manica.



of the importance of this highway project to the summer activities of Laguna Beach and the Festival of Arts, and of the necessity for handling traffic through construction as expeditiously and smoothly as possible. How good a job McCullough and his assistants did is evidenced by the reports that have come in from the local people.

Notwithstanding the delay in letting the contract, the construction work would have been completed before the 1952 Festival of Arts started except for the strike of the operating engineers and steel workers that occurred during the months of June and July. The strike so delayed the contractor that his paving operations on the Laguna Canyon highway had to be in progress during the period that the Festival of Arts was under way from July 26th to August 10th.

At the end of the strike the contractor, in order to reduce interference with the Festival of Arts to a minimum, placed all of his construction crew on the festival end of the project and completed grading, placing of untreated rock base, and placing of plant-mixed surfacing level course on the two lanes adjacent to the festival grounds. This portion of the new highway was then turned over to the city officials for parking automobiles of patrons attending the Festival of Arts and Pageant of the Masters. All construction operations were then transferred to the other end of the project during the period the Festival of Arts was in progress.

FESTIVAL OF ARTS
Laguna Beach, California

September 9, 1952

Mr. P. O. Harding
California Division of Highways
120 South Spring Street
Los Angeles 12, California

Dear Mr. Harding: The boord of directors of the Festival of Arts and Pageant of the Masters wish to express to you our sincere thanks and appreciation for the splendid cooperation and courtesies shown previous to the opening and during the showing of our annuol Festival and Pageant.

Your courtesy in permitting use of part of the new highway for porking automobiles solved a problem which hod caused us consideroble worry during the preparatory stages of our annual Festival, and we heard many complimentary comments about your thoughtfulness.

We feel that much of the success of our 1952 Pageant was due to your cooperation.

Sincerely,

BAIRD B. COFFIN
President

Contract Was for $291,200

The allotment of the Nappe Construction Company contract was $291,200. Representing the contractor on the job were William H. Irwin, General Manager, and James Blackledge, Superintendent. Their coopera-

... Continued on page 28

CITY OF LAGUNA BEACH

September 8, 1952

Mr. P. O. Harding
Asst. State Highway Engineer
Division of Highways VII
120 South Spring Street
Los Angeles 12, California

Attention: Mr. A. D. Griffin

Gentlemen: It is the desire of the office of the city engineer and the police department of this city to extend to the Division of Highways, District VII, and to the Contractor, Nappe Construction Company, their gratitude and appreciation for the unexcelled cooperation received during the construction of Route 185, Laguna Canyon Road, now nearing completion.

We wish to particularly thank your office and the Resident Engineer, Mr. C. J. McCullough, for the many courtesies extended. With the construction being underway at the time of the Annual Festival of Arts, the traffic situation was handled by the police department with minimum effort due to the cooperation of the Engineer and Contractor.

This office and the office of the chief of police greatly appreciate your courtesies and cooperation and extend their thanks to all state officials and employees concerned.

Very truly yours,

CRAIG G. LELAND
City Engineer
WM. H. BACHMAN
Chief of Police

Looking westerly from north city limits of Laguna Beach, showing on the right City Park and Festival of the Arts office and on the left construction in progress on storm drain by Orange County Flood Control District



Successful Job

Bayshore Freeway Experimental Tideland Fill Is Justified

By H. L. MOSES, Resident Engineer

THE RAPID growth of industry, residential areas and population in the San Francisco peninsular area makes it of vital importance that the Bayshore Freeway between San Francisco and peninsular points be completed at the earliest possible time commensurate with available funds.

With work now under way and recently completed in San Francisco through South San Francisco and southerly thereof through San Mateo, a good start has been made.

Development to freeway standards of the 3.2-mile section of the old road between the city limits of San Francisco and South San Francisco has been given much thought and study.

Overwater Unit

Many investigations of proposed sites and designs were considered, all of which occasioned the utmost scrutiny, for it had to be decided whether to attempt to establish freeway standards along the existing route with its limited room for expansion, bad geological formations, and high property severance values or to attempt an "over the water" crossing of an arm of San Francisco Bay between Sierra Point and Candlestick Cove.

To develop the existing roadway to freeway standards under traffic would create serious traffic interference on the already overcrowded highway, and the fact that the present road would provide an additional facility to connect the rapidly expanding peninsular areas with San Francisco were decisive factors in selection of the open water crossing for freeway development.

Route in Tidewater

The water route lay in tidewater up to 12 feet in depth over soft bay mud for some 12,000 feet, the mud varying in depth from 40 feet to 80 feet, the latter being encountered across a short reach of the bay's floor, while an average depth of some 60 feet seemed to prevail. Intensive and exhaustive investigation, research and calculations by our Materials and Research Department revealed that beneath the soft bay mud lay a thick mass of firmer mud which had been, in an earlier geological age, exposed to the atmosphere and had dried out somewhat, during which process the mud had developed strength sufficient to resist a load of at least 10 tons per square foot. This resisting strength was found to be greater than any load to be placed upon it by the proposed roadway fill and the

Aerial photograph of experimental fill clearly showing displaced mudwave





Aerial photograph of experimental fill looking north toward Sierra Point. Ultimate freeway alignment to pass through housing development and saddle in upper left-hand corner in photograph.

feasibility of constructing an earthen fill was indicated.

Further consideration of the matter resulted in the determination to conduct an experimental job based on using ordinary excavation material of whatsoever category that might be encountered in the Franciscan Formation adjacent to the proposed crossing.

The purpose of this experiment was to see if the soft mud in the upper portion of the bay floor could be satisfactorily displaced from under the roadway embankment by direct loading or whether pre-dredging would be necessary to secure stability for the roadway.

Basis for Future Design

The material was to be placed in two layers; a lower embankment 400 feet wide constructed by end dumping dirt to a height sufficient to support the contractor's equipment above high tide, but in no instance less than elevation plus eight feet and a roadway prism to be built thereon to a crown elevation of 17.8 feet with a roadway section 132 feet wide at grade.

The information obtained from building this short section is to serve as a basis for considering the method of designing and constructing the rest of the over-the-water crossing estimated to require some 6 to 8 million cubic yards of fill.

Terms of Contract

Accordingly, a contract was let which provided some 418,000 cubic yards of roadway excavation to be obtained from a state-owned borrow pit site adjacent to the beginning of the job, supplemented by some 84,000 cubic yards of excess excavation to be brought to the fill from the 17th Street to Army Street section of the Bayshore Freeway in San Francisco which was under construction at the same time. A minimum production of 5,000 cubic yards per day of roadway excavation was required in order that the mud-wave displaced by the fill be kept moving. Provision was also made to permit slowing down of the work to allow controlled settlement and consolidation of the mud under the fill.

The special provisions permitted the engineer to shut the work down when necessary to control the rate of settlement or to protect the work already in place, and the contractor would thereupon receive the bid price per hour for "idle time" for shutdown periods. No use was made of this provision as it was found to be unnecessary.

Job Extended

Work started on the job on February 5, 1952, and at the onset it became

apparent that the penetration of the fill into the mud was greater than had been estimated. As the prime object in undertaking the work was to achieve pertinent information it was felt that the job should be extended at least as far as its conceived limits into deeper water than could be reached under the full width of 400 feet and therefore a change in design was authorized which resulted in constructing the first 400 feet of the fill to a width of 400 feet in the lower embankment, the next 200 feet being 300 feet wide in the lower embankment, and the remainder to be 250 feet wide, there being no change in the roadway prism section above elevation 8.

Work for Bulldozers

The process of construction began when bulldozers broke down the steep bluff adjacent to the shore line and built a steep ramp which could be traversed by carryalls of 15-cubic yard capacity which carried the dirt to the water's edge where 'dozers pushed it out and up against the mud wave which encompassed the fill from its beginning. The fill was carried forward with a pointed bow which was found to be most effective in shearing and displacing the mud. As the fill advanced and more area developed in the borrow pit, the contractor brought in 20-cubic-yard carryalls and then Tournapulls, and when the roadway prism was constructed, sheepsfoot tampers and a 12-ton three-wheel roller provided compaction.

As the fill progressed, large shear cracks appeared, ahead of which the nose of the fill would sink and the displaced mud would emerge from under the fill in much the same manner as toothpaste being squeezed from a tube.

Problem of Settlements

The practice was to keep filling up the sunken area ahead of the cracks and to restore it to elevation +8.0 and to advance the fill by dumping around the periphery of the unstable and not fully developed areas until stability and width was reached. Sometimes a settlement of as much as five feet took

Aerial view of experimental fill looking south from Candlestick Point toward Sierra Point, the ultimate terminus of the open-water fill





Aerial photograph of the general area of the experimental fill. Visible in left foreground is the borrow pit of the Sanitary Fill Company.

place in 30 minutes, and in one instance more than 25,000 cubic yards were placed in an area of less than 30,000 square feet without extending the fill one square foot. On stabilizing an area, the fill material would be pushed out against the surrounding and forever receding mud wave, and the process would start all over again.

After completing the lower embankment the placement of the roadway prism was constructed in single eight-inch lifts, each being completed for the full length of the fill before a second lift was started. In addition, a 330-foot length of the fill received a five-foot surcharge which caused settlement to be resumed along a crack line through the surcharge area which had been extremely active during the placement of the lower embankment. Equilibrium was restored in this area in a few days and settlement slowed down to normal. The balance of the dirt remaining to be placed after the surcharge was placed was used to build the lower embankment to Station 21 which is 1,500 feet from shore.

Experimental Success

The job has been a success in that a wealth of information has been obtained on which to base the design for future extensions.

The project has received more than the usual attention in the Division of Highways because of the challenges it presented and its experimental nature. Former Assistant State Highway Engineer Jno. H. Skeggs gave it his personal attention before his retirement, and to no less a degree has his successor, Assistant State Highway Engineer B. W. Booker, District Engineer J. P. Sinclair, Assistant District Engineer R. P. Duffy, and District Construction Engineer W. Travis. The Materials and Research Department maintained liaison through Supervising Physical Testing Engineer A. W. Root and Assistant Physical Testing Engineer W. Weber. The contractor was Edward G. Keeble of San Jose, and the Superintendent, Anthony Bruno. The writer was Resident Engineer.

Good Investment

Division of Highways Benefits From Bishops Road Disposal Area

By RAY A. COLLINS, Associate Highway Engineer

The Bishops Road disposal area had its origin due to the initiative and foresight of Spencer V. Cortelyou, formerly Assistant State Highway Engineer for the Los Angeles metropolitan area, who retired in 1949 after 37 years of state service.

On state highway projects generally, it is possible to so establish the alignment and grade systems that roadway excavation to be made usually balances with the required roadway embankments, so that there is no problem of providing locations for disposal of excess material. Generally speaking, this is not the situation in the case of freeway construction in a metropolitan area such as Los Angeles presents. Right of way costs and other vital considerations more than outweigh any possible savings that could be made by balancing the grading quantities, and unavoidably large amounts of excess roadway excavation develop.

During the preliminary studies for the Los Angeles Metropolitan Freeway System, Mr. Cortelyou was impressed by the magnitude of excess roadway excavation and also the large amount of concrete and masonry removal that the freeway construction would require. It was evident to him that if the State could provide a site for the disposal of excess excavation within a reasonable haul distance, contractors would be able to submit to the State much lower bid prices for grading work on the freeway projects than if this matter of disposal was uncertain and left to the contractors to work out as construction proceeded.

Mr. Cortelyou made a thorough investigation of available sites and finally picked the location in the canyon occupied by Bishops Road, a distance of 1½ miles from the Los Angeles Civic Center. The site which he chose was the area lying between Yale Street on the east, Effie Street on the west, Bishops Road on the north, and the top of the ridge which divides Bishops Road Canyon and Chavez Ravine on the south.

Bishops Road got its name from the fact that back in the early Spanish days when the city was called "El Pueblo de Nuestra Señora la Reina de los Angeles de Porciuncula," a monastery was located in this canyon. Next in development came a brick manufacturing establishment which supplied material for many of the early buildings in the Los Angeles Civic Center area.

At the time the State entered into negotiations for acquisition of property along Bishops Road, this land was officially listed as uninhabited. However, this was not strictly in accordance with the facts because there were a large number of packing box, sheet iron, and palm leaf shacks and some caves nestled in the gullies and among the brush that were the homes of winos and other characters in the no-income bracket. These substandard dwelling places, of course, had to go when the State Division of Highways started dumping material in this area.

During the year 1945 Headquarters Office approval was obtained and right of way acquisition negotiations were started that resulted in the purchasing of 36.6 acres of privately owned property at a total cost of $79,000. In 1947, when it became desirable to have additional area available, Mr. Cortelyou made arrangements with the

Looking southerly toward Bishops Road disposal area from top of opposite hill. Trees in Elysian Park show on skyline center left. Haul road in center of photograph near top of ridge is at 600-foot elevation. Bishops Road, at approximately 400-foot elevation, is shown center left.





Bishops Rood disposol oreo from top of dump looking northwesterly, showing terraces thot have been constructed as filling has progressed. The looded truck shown ot right is troveling on Bishops Road and is about to moke left turn onto Effie Street to get to the top of the dump. Trees in the background ore in Elysian Park.

Los Angeles City Park Department to get permission to place waste material upon 9.1 acres of the Elysian Park area adjoining the privately owned land that had already been acquired. Before permission was granted the State to utilize the city park land for filling purposes, the State was required to move to other permanent locations a large number of quite sizable ornamental trees. Many of these had been officially planted and dedicated with appropriate ritual and ceremony by various organizations.

In making this total area of 45.7 acres available for disposal of waste material from the freeway construction contracts, it was necessary for the State Division of Highways to remove and reconstruct 525 feet of four-inch steel water line belonging to the Los Angeles City Park Department, and also rebuild outside the fill area 1,500 feet of 24-inch cast-iron pipe that belonged to the Los Angeles Department of Water and Power. The cost of this pipeline reconstruction was about $31,000, thus making the total cost of the Bishops Road disposal area $110,000. As will be shown later on, this is but a small fraction of the monetary advantage to the State which has already been obtained by having this area available during the freeway construction.

The Bishops Road disposal area is not at all the usual type of a dumping ground with a deep hole to be filled. The waste material is being disposed of by dumping between the road in the bottom of the canyon and the top of the ridge to the south, the result being the narrowing of the canyon and the creation of a hillside slope considerably steeper than originally existed. The Bishops Road disposal area as now filled has been called "the man-made mountain." One feature story writer went so far as to call it "a hill of a fill."

The fill is being carried up using approximately 1½-to-1 slopes. At each 50 feet of height, a bench 25 feet wide is being provided to create a terraced effect. On the terraces thus created and on the slopes eucalyptus trees are being planted for erosion control and beautification. The specifications require that the fill material shall be brought up in layers that do not exceed two feet, and that as much compaction as possible shall be obtained by routing the trucks over the filled area.

Filling operations were started on the Bishops Road disposal area in 1946 and have proceeded almost continuously since that time. The freeway construction contracts that have contributed waste material to the Bishops Road disposal area, in chronological order, are as follows: the Grand Avenue Overcrossing; the four-level traffic interchange structure; the Figueroa Street Overcrossing; the Alpine Street Overcrossing and Arroyo Seco Parkway southerly extension; the Main Street Overcrossing; Los Angeles Street Overcrossing; Broadway Overcrossing; Hill Street Overcrossing; the Los Angeles County parking lots adjoining Hill Street from Temple Street to the Hollywood Freeway; the Los

Angeles City Board of Education parking lot adjoining the Hollywood Freeway; and the various sections of the Hollywood Freeway from Hollywood Boulevard to Los Angeles Street. At the present time waste excavation is being hauled to the Bishops Road disposal area from the Alameda Street Overcrossing on the Santa Ana Freeway. Very soon excess excavation material will be hauled to the disposal area from the construction operations now under way on the Hollywood Freeway from Hollywood Boulevard to the Pilgrimage Bridge.

In order to be sure that the excess excavation hauled to the disposal area was distributed and compacted in accordance with the specifications and also to prevent unauthorized dumping, it has been necessary for the State Division of Highways to maintain a representative on the ground at the disposal area. For the past five years this position has been held by Dick Jones, Assistant Highway Engineer. Since Jones has been on the job continuously and watched the dump grow from small beginnings to great proportions, with the fill rising from the bottom of the canyon for some 200 feet above Bishops Road, he has earned the title and is frequently called "The Old Man of the Mountain." At other times he is more respectfully referred to as "The Master of the Dump."

On the disposal area there are no monuments or gravestones telling what is buried underneath, but very deep down within the mass of fill are the last remains of the historic Fort Moore Hill, the famous double-roofed Broadway Tunnel, the Pacific Electric Railway Tunnel, the remains of the old original Los Angeles High School, and a large portion of the City of Los Angeles Board of Education Administration Building. Buried here also are the hopes of the prospectors who avidly sought the hidden treasure they were so certain that the Spaniards had concealed in Fort Moore Hill.

Very great benefit has been obtained from the Bishops Road disposal area not only as a place upon which to dump excess and waste material, but also because of what it has furnished to some of the freeway projects. When the four-level traffic interchange structure was being finished, imported borrow was needed to make the embankment approaches. This the contractor obtained by making excavations at the Bishops Road disposal area. Some 52,000 cubic yards of imported borrow was obtained. During the removal of the portion of Fort Moore Hill to make way for the Hollywood Freeway and to provide building and parking sites in the Civic Center for future planned Los Angeles County and Los Angeles City buildings, a stratum 35 feet thick of ancient stream bed of the Los Angeles River was uncovered. Tests indicated that this granular material was suitable for use in subbase under portland cement concrete pavement. With this information it was decided to stockpile this material in a certain section of the Bishops Road disposal area for future use in paving contracts on the Hollywood Freeway. A stockpile was created of 180,000 cubic yards of selected subbase material that was later utilized on Hollywood Freeway paving contracts. Thus the Bishops Road disposal area has served a triple purpose. Not only is it a dumping ground for unwanted waste material, but it has contributed badly needed imported borrow material for roadway embankments and also served as a temporary storage space for high-grade imported subgrade material.

Truck depositing waste materiol from Sonta Ana Freeway excavatian naw in progress far the Alameda Street overcrossing. Dumping operations where shown are at the 585-foat level af the Bishops Raad disposal area. Trees in left backgraund are in Elysian Park. The top of the ridge is at approximately 675-faot elevation, and this ridge is the sauthwest praperty line of the Bishaps Raad dispasal area.





BEFORE—Looking westerly from roof of Federal Building in Los Angeles Civic Center along Hollywood Freeway location before start of grading construction. In foreground right is Fort Moore Hill with Broadway Tunnel portal showing in center foreground; just to the center right is the old Los Angeles High School before wrecking operations had started; still further to the right are the Los Angeles City Board of Education buildings with foundations showing where 60 feet of one of the buildings had already been removed. In background are the Hollywood Hills.

Evaluation of Items

As of the present time a very conservative evaluation has been made of the items involved in the Bishops Road disposal area, as follows:

52,000 cu. yds. imported borrow for roadway embankments @ 50¢	$26,000
180,000 cu. yds. selected subbase for use under pavement @ $1	180,000
5,000,000 cu. yds. wasted excess excavation material @ 50¢	2,500,000
Total	$2,706,000

With the total cost of the Bishops Road disposal area, as indicated above, being $110,000, this represents a 2,500 percent return on the original investment and certainly vindicates Mr. Cortelyou's good



AFTER—Taken from top of Federal Building, shawing completed Hollywood Freeway extending from Braodway in the foreground ta Belmant Avenue pedestrion bridge in background. Ta the right are the Las Angeles City Board of Educatian buildings with erosion control landscaping operations in pragress on the cut slope alangside the Board of Educatian buildings. Camparing this phatagraph with the ane an page 20 will give a gaad idea af haw much material was hauled fram the sectian af the Hallywaad Freeway in the Los Angeles Civic Center ta the Bishaps Raad disposal area.

judgment in advocating and arranging for the acquisition of this disposal site. And best of all, the favorable balance is increasing day by day.

After the filling has been completed on the Bishops Road disposal area, the acreage formerly in Elysian Park will be turned back to the Los Angeles City Recreation and Park Department along with other filled areas adjoining, so that road construction and developing can be carried out.

THE FOUR-LEVEL GRADE SEPARATION STRUCTURE ON LOS ANGELES METROPOLITAN FREEWAY SYSTEM

The location of the four-level grade separation structure, about one-half mile westerly of the Los Angeles Civic Center where the Hollywood Freeway crosses the Harbor Freeway-Arroyo Seco Parkway (one being a continuation of the other), has been referred to as the "hub" of the freeway system. At this location, where a very complicated traffic interchange problem was recognized to exist, the State Division of Highways initiated, designed, and constructed a four-level grade separation structure that is the first of its kind to be built.

The top level of this structure is now in use carrying traffic on the Hollywood Freeway between Los Angeles Street, in the Civic Center, and Western Avenue, in Hollywood. Other levels of this traffic interchange structure were placed in use when the half-mile section of the Harbor Freeway was completed between Temple Street and Third Street on July 30th.

The building of the four-level grade separation structure has introduced a new method of handling exchange traffic between freeways that is greatly simplified over the conventional types of interchange systems such as the four-leaf clover type, in which the left turn is accomplished by means of a three-quarter turn or 270-degree loop to the right. In the clover-leaf type there is also an overlap of acceleration and deceleration traffic with resulting serious conflict and confusion. Other types of interchange systems employ reversing curvature and circuitous travel for some of the traffic movements, together with numerous bridge structures, all of which are detrimental to smooth and economical operation.

The four-level grade separation eliminates these objectional features by providing a simple turn for all traffic movements in the direction in which each wishes to go, and without excess distance over that which would be required in ordinary highway travel. It should be noted that the take-off from one freeway and junction with another freeway is in all cases made on the right side of the freeways.

In the four-level grade separation the basic feature is that the four separate roadway levels are so arranged as to pass one another at one point in a

. . . Continued on page 43

This display of four-level structure in window of Hollywood Citizen-News attracted much attention



Harbor Freeway

Important New Section Is Opened to Traffic

A SMALL but important section of the Harbor Freeway in Los Angeles was opened to public use on July 30th. The new section is but 0.6 mile long and extends from Temple Street to Third Street in the downtown crowded district.

The section is not so important as a traffic artery as it is as an adjunct of the big four-level structure that was started in 1948. This structure is to be the separation point for all the freeways entering Los Angeles.

Heretofore, the Hollywood Freeway has been using the top level only. The section through the Civic Center, leading to the Santa Ana and the Ramona Freeways, is a continuation of the Hollywood Freeway.

But with the opening of this new section of the Harbor Freeway the public has begun to use three levels of the massive structure. With the opening of the connection to the Arroyo Parkway, some time next spring, all four levels of the big structure will be in use.

Civic leaders from the City and County of Los Angeles participated in dedicatory ceremonies. John Anson Ford, represented the Board of Supervisors; Mayor Fletcher Bowron, the City of Los Angeles; Felix Chappellet, the Los Angeles Chamber of Commerce; and Edward R. Valentine, the Downtown Business Men's Association. Robert Mitchell acted as master of ceremonies and represented the Los Angeles Metropolitan Traffic Association.

The speech officially opening the new section was made by Harrison R. Baker, Highway Commissioner from Pasadena, who also was the ribbon cutter. He introduced James A. Guthrie, Highway Commissioner from San Bernardino. Baker stressed the importance of this new section, not so much for its length but because it started the use of the four-level structure.

As far as length is concerned it was pointed out that the exit from the new section was on Beaudry Street near Second Street and the entrance was from Third Street. But the shortness of the new section did not detract from its cost as the over-all costs for bridges, grading, paving, lighting, and right of way totaled something over $4,000,000.

Baker pointed out that the next section of the Harbor Freeway, to be completed some time next spring, would take the motoring public as far as Olympic Boulevard and that shortly after that section is opened the connection with the Arroyo Parkway will be completed.

Harbor Freeway looking east from near Temple Street. Four-level structure in background.



Notable Career

Charles H. Whitmore Retires On Record of Achievements

NEARLY 500 persons gathered in the Elks Club in Marysville on August 29th to pay honor to Charles H. Whitmore on the occasion of his retirement from a distinguished 29-year career of service with the Division of Highways.

For all but the first six of those 29 years Mr. Whitmore was District Engineer of District III, which comprises 11 counties in the Sacramento Valley and Sierra Nevada regions. The civic and professional leaders present to pay tribute to his outstanding contributions to the development of the road network in that large area included officials of the various counties and cities with whom he worked, as well as engineering colleagues and contractors.



CHARLES H. WHITMORE

Born in Kansas

In half a century of engineering work, Mr. Whitmore's career paralleled those of many engineers and surveyors who contributed to the building of the West, particularly its transportation facilities.

He was born in Emporia, Kansas, August 21, 1882. When his father died in 1894 the family moved to DeKalb, Illinois. His basic education was acquired in the public schools of both those states, and his engineering studies took place at Oberlin College in Ohio, supplemented by correspondence courses.

Like many other highway builders of his generation, Mr. Whitmore's first engineering work was on railroad location and construction. From 1902 to 1907 he held positions ranging from chainman to resident engineer on railroad projects.

His Work in Texas

In 1908 El Paso County, Texas, provided funds for construction of the first hard surface roads in the county outside the limits of the City of El Paso. Mr. Whitmore obtained the position of assistant county engineer and later became county engineer. In the course of three years there he supervised construction of about 30 miles of crushed rock base and oil penetration surface roads. The project was one of the first in the United States to which the U. S. Bureau of Public Roads assigned an official observer for training.

Between 1911 and 1915 Mr. Whitmore was in Montana, this time engaged in irrigation work. As district engineer for a land and water development company he was in charge of constructing canals, laterals and a rock-fill dam and storage reservoir.

He returned to road construction in 1915, for Multnomah County in Oregon. As in El Paso, that county was undertaking the paving of many miles of county roads, the first roads in Oregon to be paved outside the limits of cities. For the next three years he served as Assistant County Engineer and then as County Engineer.

Pioneered Oregon's Gas Tax

The paved roads of Multnomah County spurred a demand for paved state highways. Funds were lacking, however. Mr. Whitmore participated in the ensuing discussions of ways and means which brought forth the idea of a tax on gasoline, in which Oregon pioneered, enacting in 1919 the first gas tax measure for highway construction revenues.

From county work Mr. Whitmore's next and logical move was to state highway work, and he served as a District Engineer for Oregon until he came to California in 1923.

For approximately five years he served as District Construction Engineer in District IV, San Francisco, under Colonel John H. Skeggs, who retired earlier this year. In 1928 Mr. Whitmore was appointed District Engineer of District I, at Eureka, and the following year moved to Marysville in a similar capacity.

Fine Record in District III

The 1,340 miles of state highway contained within the boundaries of District III range from high mountain pass routes to metropolitan freeways. About 600 miles of this total were former county roads added to the State Highway System in 1933. Under Whitmore's guidance maintenance standards were raised and many improvements were accomplished despite a lack of adequate funds to meet the ever-increasing needs of traffic.

Some of the projects accomplished or begun during the last several years of Mr. Whitmore's tenure are providing or will provide relief from serious traffic congestion on heavily traveled routes. The North Sacramento Freeway is one of these. Others included the Roseville Underpass, the Marysville-Yuba City Bridge and its approaches and the four-lane divided highway between Davis and Sacramento on U. S. 40.

The most challenging task for the construction and maintenance personnel under Whitmore's direction has been, of course, the reconstruction of surfacing, maintenance of roadway and removal of snow on U. S. Highways 40 and 50 and other routes over Sierra summits and in the Lake Tahoe area. This task assumed herculean proportions in the wake of record-breaking storms during the winter 1951-52.

Mr. Whitmore will continue to make his home, upon retirement on a two-acre tract on Franklin Road, near Yuba City, where many friends have admired his secondary accomplishments as gardener and chicken raiser.

A. M. Nash Now Is in Charge Of District III

RESPONSIBILITY for improving and maintaining the 1,340 miles of state highway in 11 Sacramento Valley and Sierra Nevada Counties has been assumed by A. M. Nash as District Engineer of District III, State Division of Highways, with headquarters at Marysville.

He succeeds Charles H. Whitmore, who retired after 29 years of service with the Division of Highways, the last 23 of them as District Engineer in District III.

Nash was transferred to his new post from District I, Eureka, where he had served as District Engineer for seven of the last 10 years. A native of Kansas, Nash was educated in the public schools of Idaho and Washington and attended the University of Washington. After a short period of highway and railroad engineering work he served as a second lieutenant in Army Aviation in World War I, and in 1920 began his career with the Division of Highways as a draftsman and computer in the headquarters office in Sacramento.

From 1924 to 1934 Nash was on the staff of District X, Stockton, successively as chief draftsman, district right of way agent and resident engineer on construction projects. He then returned to the Sacramento headquarters office for seven years, doing administrative and planning work.

In 1924 he was appointed District Engineer of District I, holding that post until he was recalled to Sacramento in 1946 as Engineer of Design. In October, 1949, he returned to Eureka as District Engineer.

Nash's highway engineering accomplishments have won recognition beyond the borders of California. He is a former vice president of the Western Association of State Highway Officials; a member of the Committee on Culverts and Culvert Pipe of the Highway Research Board; and a member of the Committee on Highway Location, Surveying and Mapping of the American Road Builders Association.



A. M. NASH



CLYDE V. KANE

NIGHT DRIVING

Slow down at sundown. If you drive faster than 45 at night, you are overdriving your headlights. When you can't stop your car within the visibility range of its headlights, you are headed for unseen trouble.

Clyde V. Kane Moves to New Post in Eureka

THE POST of District Engineer in District I, comprising Del Norte, Humboldt, Mendocino and Lake Counties, has been assumed by Clyde V. Kane, succeeding A. M. Nash.

Nash has been appointed District Engineer of District III, an 11-county area with headquarters in Marysville, to fill a vacancy caused by the retirement of C. H. Whitmore.

Kane comes to the northwestern district after 24 years of highway engineering work in District VIII, San Bernardino and Riverside Counties, where he advanced through the ranks to the post of assistant district engineer.

Part of his boyhood was spent in his new district. He was born in New Mexico, but was graduated from Clear Lake Union High School in Lakeport in 1921.

His first engineering job was on a survey party for the Southern Pacific Railroad, initially in the Imperial Valley and later in Oregon. He then entered the University of California, and received his B.S. in civil engineering in 1927. After brief periods in South America and in San Francisco, he joined the San Bernardino office of the Division of Highways as a draftsman.

Successively he become construction inspector, resident engineer on highway construction projects, and chief draftsman. In November, 1942, he entered military service with the Army Engineers. He served for more than a year as chief of the engineering division for the construction of a portion of the Pan American Highway in Central America, and then moved halfway round the world to Burma, where he was area engineer in charge of constructing and maintaining part of the Ledo Road and nearby airstrips.

Returning to California in 1946, Kane was placed successively in charge of highway location and construction for the San Bernardino District, and in 1950 he assumed administrative duties as assistant district engineer.

Kane will make his home in Eureka, headquarters of District I, with his wife and two children.

Veterans Retire

Maintenance Department Loses W. A. Smith and H. L. Cooper



WILLIAM A. SMITH—1952

TWO VETERANS of the Maintenance Department of the Division of Highways retired on the same day, August 1, last. Both of them, William A. Smith and H. L. Cooper, held the title of Assistant Maintenance Engineer. The former served with the department for 33 years and the latter for 27 years.

Mr. Smith was born in West Settlement, a farm community near Roxbury-in-the-Catskills, New York. He began his education in the same red schoolhouse where John Borroughs, the naturalist, and Jay Gould, the New York financier, sat as boys a generation earlier. He then attended the Roxbury High School. In 1911 he received his science degree in civil engineering from Iowa State College.

Served in Army

From 1912 to 1917 Smith was employed by the Baltimore and Ohio Chicago Terminal Railroad on construction and railroad valuation work in Chicago as well as in Ohio and Indiana. He was with the Quartermaster Corps of the U. S. Army during 1917 and 1918 on the construction of Camp Taylor at Louisville, Kentucky, and of the Port Terminals constructed at Newark, New Jersey, and at Charleston, South Carolina. At the close of the war he returned to railroad work at Baltimore, Maryland. In 1919 he moved to California and in September of that year was employed by the California Highway Commission. He was assigned as assistant and resident engineer to various construction projects in District III, which at that time included the present District X territory. From 1921 to 1923 he was in charge as resident engineer of construction work in Colusa, Amador, and San Joaquin Counties. In 1924 he was advanced to office engineer for District III at Sacramento.

Transfers to Headquarters

In 1926 Smith transferred to the Headquarters Maintenance Department as assistant maintenance engineer in charge of the office administration and related matters. He continued in this work together with occasional special assignments, until his retirement. During this period he was active in the development of the maintenance work, particularly in connection with programming the work and organization matters.

HERBERT L. COOPER





WILLIAM A. SMITH—1919

Smith has a daughter, Marian, who is employed as assistant personnel technician by the Division of Highways, and a son, George, who is an associate highway engineer with the District III organization at Marysville. Smith and his wife plan to continue to live in Sacramento.

N. R. Bangert succeeds Smith.

Herbert L. Cooper

Herbert L. Cooper was born in Chicopee, Massachusetts, and graduated from Lehigh University as civil engineer in 1913.

He worked one year as civil engineer for the Springfield Massachusetts Gas Company; two years as surveyor for U. S. Forest Service in Tennessee, Virginia, and New Hampshire; one

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Retirements *from* Service

HARVEY P. GAY

On September 1, 1952, Harvey Page Gay, machinist at Headquarters Shop of the Division of Highways at Sacramento, retired after 29½ years of service.

He entered state service at Headquarters Shop on April 30, 1923, and, with the exception of a period of several years, when he was stationed in Willits, has been continuously employed at Sacramento.



HARVEY PAGE GAY

Gay was born 66 years ago at Rockingham, North Carolina, and graduated from high school there. After one year of study at the University of North Carolina, he began his apprenticeship to the machinist trade in October, 1902, with the Mecklenburg Iron Works at Charlotte, N. C., completing his training in 1906.

From then on, Mr. Gay led an interesting and varied existence, one which carried him to the British Isles, to Panama and Cuba, and to every state in the Union except North Dakota.

As a young journeyman, he worked as machinist and as tool and diemaker for various railroads and manufacturing concerns, and also as roundhouse foreman for the Southern Railway. On leaves of absence he found time to play three seasons of professional baseball with the South Atlantic League and the Southern Association.

Admitted to Bar

In the period between 1908 and 1916 he attended night classes at Atlanta Law College, and in 1916 was admitted to the Georgia Bar. It didn't take Harvey long to find out that the legal profession was not for a young man with

. . . Continued on page 28

LOUIS F. RAMPONE

Louis F. Rampone, Highway Maintenance Leadingman, of San Juan Bautista, retired from state service on July 1, 1952.

Mr. Rampone was born in Oakland, California, May 30, 1894. In 1914 he was employed by the Bank of America and in 1915 he took his first job with the State. His job was "shaking plow" during the construction of the Old San Juan Grade, a concrete highway.

He entered the military service as an observer in reconnaissance on August 4, 1917. He was with the 88th Aero Squadron and has seven campaign ribbons—Château-Thierry, Belleau Wood, Meuse-Argonne, Montfaucon, Aisne-Marne, Oise-Aisne and Saint-Mihiel. He received his discharge from the Army on August 7, 1919, after having spent about seven months with the Army of Occupation in Trier, Germany.

After his discharge from the Army he worked at various jobs and again returned to work for the Division of Highways October 5, 1926, as a truck driver at San Juan Bautista. Later he was made leadingman at Hollister.

On June 8, 1925, he was married to Lillie Sarah Baccala at Hollister. They make their home in San Juan Bautista.

"Louie" is very popular with all the men in the territory who worked with him and is considered by them to be a very able and conscientious worker. On July 2d, his friends with the Division of Highways honored him with a dinner at the Villa Pace in Hollister.

Mr. Rampone expects to remain in San Juan but looks forward to spending a lot of time fishing and hunting, his favorite sports.

W. H. HOLMES

After 24 years of continuous service with the Division of Water Resources, W. H. Holmes resigned on October 3, 1952, to enter private practice. He had been principal engineer, design and construction of dams, for the State with headquarters in Sacramento for the last 10 years. For the prior 12 years, he was located in Los Angeles in charge of similar work for that area.



W. H. HOLMES

Following the disastrous failure of the St. Francis Dam in Los Angeles County in 1928, the Legislature, in 1929, passed the act providing for supervision by the State Engineer of construction and maintenance of all dams in the State with the exception of federally owned dams.

During the first 13 years of Holmes' activities in state supervision of dams, 41 dams were constructed in the southern part of the State at a cost of $48,000,000 and 58 dams constructed in the northern area at a cost of $11,000,000. In the last 10 years, 129 dams have been constructed at a cost of $68,000,000.

In addition to supervision of construction, inspection of 507 dams previously constructed revealed many of them had not been built satisfactorily. Patience and persistence have developed an acceptance by the public of increase in standards of safety requirements and extensive repairs have been made to many dams.

Prior to World War I service in France, Holmes worked a short time for the Highway Department. He began his professional career by designing and working on the construction of Stanford Stadium, after graduating from Stanford University in 1921. His

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W. H. HOLMES

Continued from page 27 . . .

first experience on dam construction was on Don Pedro Dam, owned jointly by the Turlock Irrigation District and Modesto Irrigation District.

He was irrigation engineer for the Modesto Irrigation District for six years, but resigned in 1928 to work on state dam supervision which gave him an opportunity to extend his study of prior college interest in mathematical and photoelectric studies of stress distribution in mass concrete. He has maintained an interest in study of soil compaction. The art of soil mechanics started about 1930 and sufficient theory and experience has been developed to justify the construction of high earth compacted dams.

After some relaxation, Mr. Holmes plans to do some research and enter private engineering practice in Sacramento. Holmes lives with his wife at 905 46th Street in Sacramento.

Festival of Arts

Continued from page 12 . . .

tion in carrying out the construction on this project was greatly appreciated by the city officials and Art Festival Committee, as attested by the letters that have been received.

Kenneth E. Overaker, Managing Editor of the *South Coast News*, published the following editorial:

"Those of us in Laguna Beach who had been here long enough to know some of the traffic and parking problems created by the crowds who throng to our annual Festival of Arts groaned when we heard that the State Highway Department was undertaking construction of the new four-lane canyon highway in the spring of the year. 'They'll be working on it just about the time of the festival,' was heard around town. Reassurances came from highway officials that the work would be done by the time the festival started.

"And it would have been had it not been for the strike by the operating engineers.

"How it came about that one lane was completed and opened to traffic and the other was surfaced and opened to parking for the festival crowds bespeaks splendid cooperation on the part of the State, the construction company, and others concerned. Many of us appreciated this effort and the added parking facilities.

"As the parkway becomes planted and the improvement completed, more and more we recognize what a splendid 'doorway' to Laguna Beach has been developed for us."

WILLIAM A. SMITH
HERBERT L. COOPER

Continued from page 26 . . .

year as estimator for Johns-Manville Company, Philadelphia, Pa., and from there went to Officers Training Camp at Camp Lee, Virginia.

He served as 2d and 1st Lieutenant, Corps of Engineers, in the United States and France about one and one-half years. He worked for Jones and Laughlin Steel Company as civil engineer for one year and due to poor health came to California. For three years he was with San Diego and Imperial Counties as inspector and resident engineer and one year with Standard Oil Company at El Segundo; and two years with U. S. Bureau of Public Roads as resident engineer in Arizona.

Enters State Service

He entered state service in District VIII, September 21, 1925, acting as resident engineer, transferred to District I as resident engineer and then to District V in 1928. He served as resident engineer, chief draftsman, assistant district maintenance engineer, and district maintenance engineer from 1928 to 1945.

Cooper was transferred to Headquarters Maintenance Department as assistant maintenance engineer on special assignments and maintenance experimental work under Thomas H. Dennis to reduce costs and perform more efficient maintenance work. He was appointed representative of the Department of Public Works in 1950 by the Director of Public Works, the late C. H. Purcell, to represent the department on the staff of General W. M. Robertson, State Director of Civil Defense.

Herbert P. O'Donnell was elevated to Cooper's post.

HARVEY P. GAY

Continued from page 27 . . .

the wanderlust, or for one with a love for heavy machinery and transportation. He accordingly gave up his practice and, with the entry of the United States into the first World War, entered the service of the United States Government with the Railroad Administration, which at that time assumed control of the railroads of the United States. Later he worked at Washington, D. C., Navy Yard and, after a period of touring the Country as a "boomer" machinist, he drifted out to the West Coast where he was employed as tool and diemaker at Mare Island Navy Yard, settling down later at Sacramento.

Mr. Gay was married on September 14, 1919, to Eleanor (Merry) Gay of Sacramento.

Active Moson

He has been very active in Masonic circles, is a Past Master and is now Treasurer of Capital City Lodge No. 499, F. & A. M. He is a talented singer and quite active in church circles.

Harvey is one of those fortunate people whose occupation is also their hobby. He plans on devoting quite a bit of his spare time to his home machine shop; his present project being the construction of a milling machine.

While Mr. and Mrs. Gay plan on remaining in Sacramento, their plans do include quite a bit of traveling around the United States. In particular Harvey intends to visit North Dakota, thereby completing the tour of the United States which his state employment interrupted. They will be pleased to greet their many friends at their home at 2630 San Jose Way, Sacramento.

FINGERPRINTING A HIGHWAY

By M. L. NELSON, Assistant Physical Testing Engineer

ENGINEERS of the California Division of Highways are constantly striving through materials research and design methods to provide highways which will offer the maximum in safety to the traveling public. One of the hazards to vehicles operating at high speed is the danger of skidding, and a great deal of research and study is being directed toward a solution to this problem.

Under the direction of Professor Ralph A. Moyer, personnel of the Institute of Transportation and Traffic Engineering of the University of California have been engaged for some time in performing physical tests with special equipment which measures, at various speeds, the coefficient of friction of tire contact with pavement surface on all types of highway surfaces both in wet and dry conditions. (*Reference Highway Research Board Bulletin No. 37, R. A. Moyer and John W. Shupe.*)

Skid Resistance Study

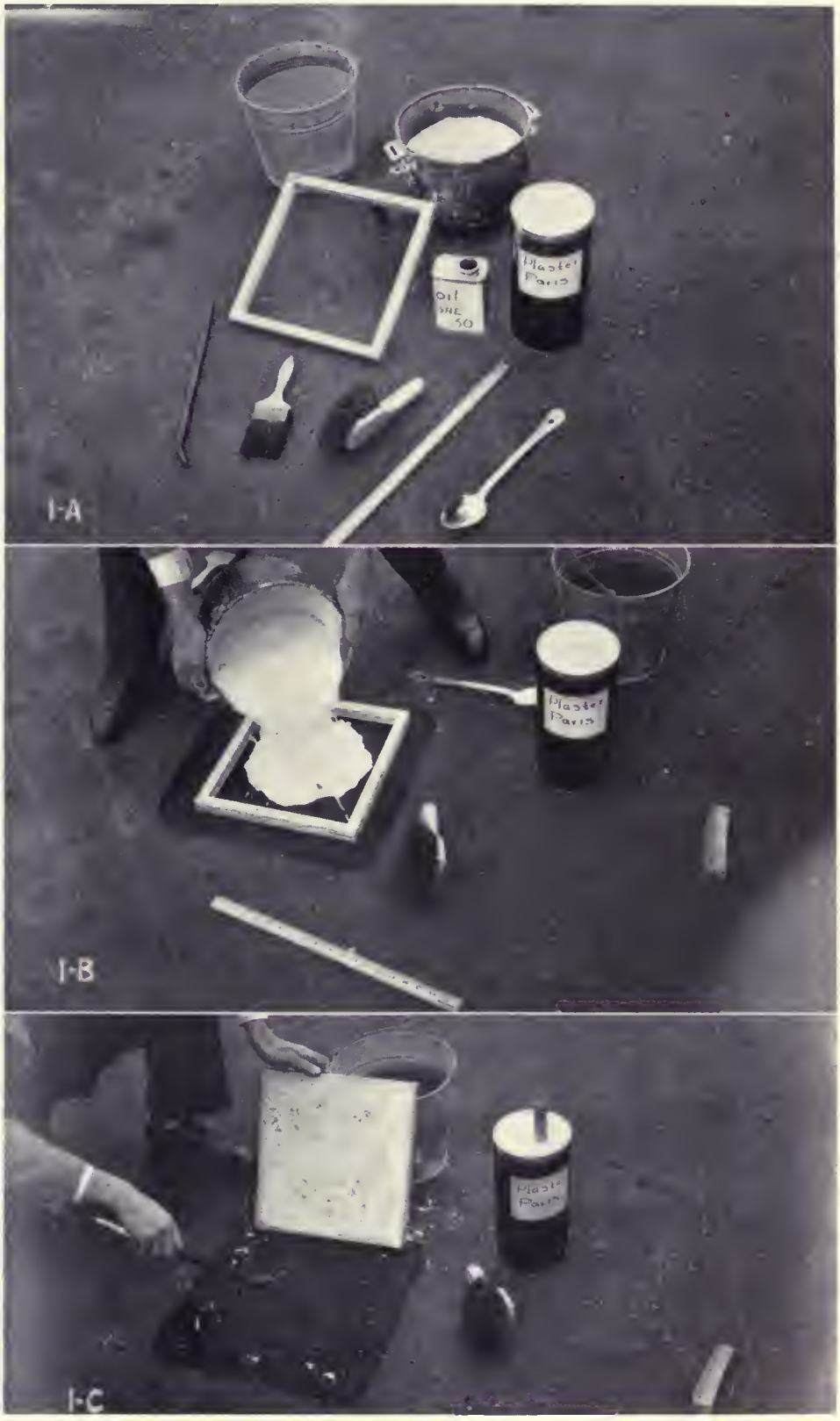
As an integral part of the skid resistance study, close-up photographs of the pavement texture were desirable; however, due to the many variables of lighting and differences in coloring of the aggregates, it was readily apparent that a true picture of the surface texture would depend on some method that would eliminate camouflaging factors of color and lighting. The Materials and Research Department assumed this part of the operation and solved this problem by making plaster casts or "negatives" of the pavement surface and photographing positive plaster replicas of the pavement surface under controlled lighting.

The equipment for making the plaster casts is simple *(See Figure 1-a)* and consists of the following items:

Wood frame 12 inches by 12 inches by 1 inch, reinforced with wire laced through the frame, crossed at the center and twisted to tighten.

Mixing bowl, approximately 6-quart capacity.

Water container.



1-A

1-B

1-C

Large spoon for mixing plaster.
Straight edge for striking off excess plaster.
Stiff broom or brush for cleaning pavement surface.
Paint brush for applying oil to the surface.
Small wrecking bar for removing cast from pavement.
Plaster of Paris.
S.A.E. 30 lubricating oil.

The procedure for obtaining the cast consists of selecting a representative area of pavement where skid tests were made, thoroughly cleaning the area by brooming with a stiff brush or broom and painting the cleaned surface with S.A.E. 30 lubricating oil. The frame is placed flat on the oiled surface and filled with the plaster of Paris which has been mixed with water to a consistency approximating thick paint (*See Figure 1-b*). The sides of the frame are tapped lightly to assure the plaster flowing down into the surface irregularities and with the straight edge the excess plaster is struck off.

The normal waiting time for the plaster to harden is approximately 40 minutes and any attempt to remove the cast sooner usually results in a cracked cast.

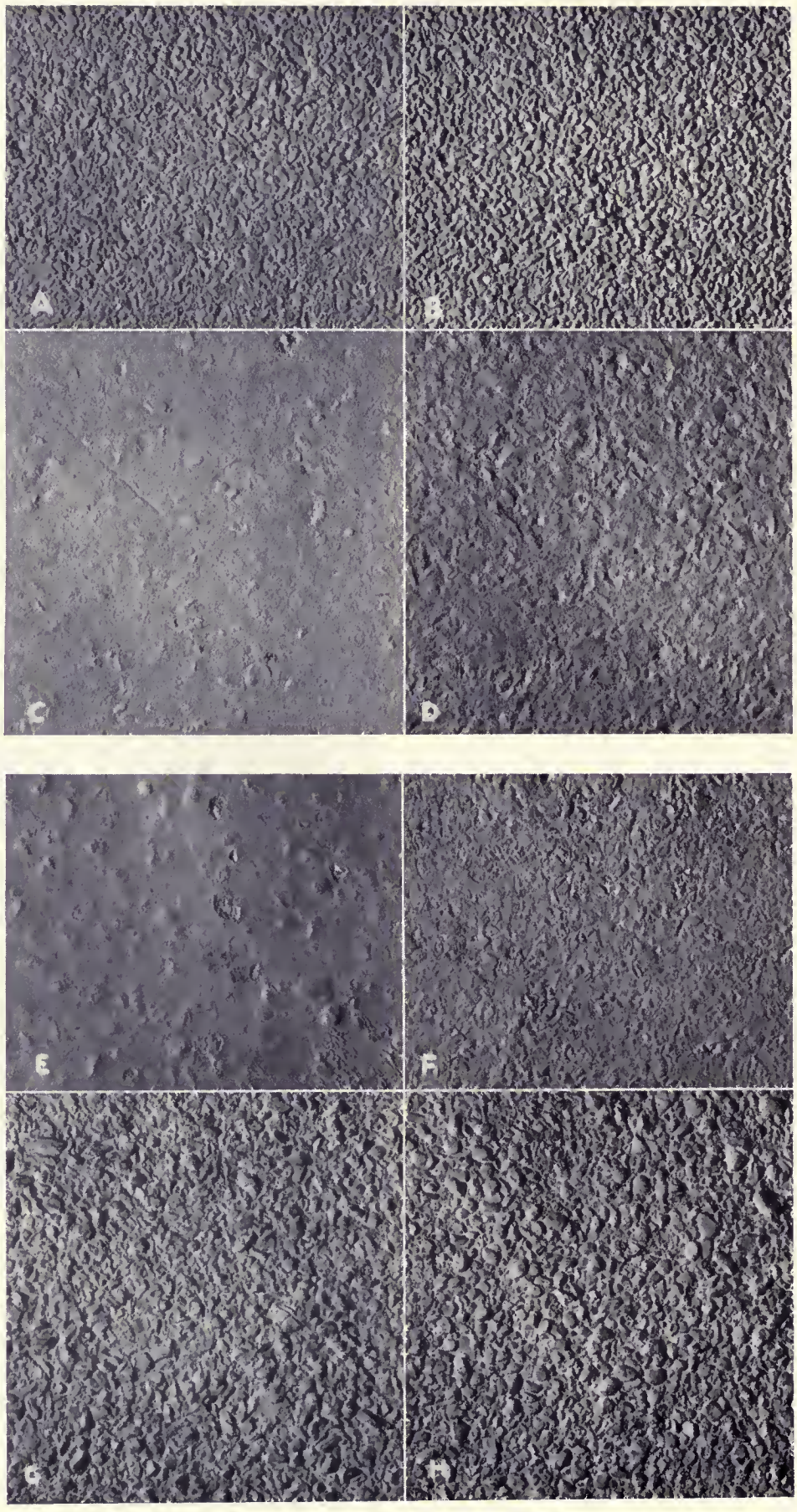
A small wrecking bar works very well in prying the completed cast from the pavement (*See Figure 1-c*).

The cast made from the pavement surface represents the negative and from this negative a superimposed plaster cast is made to provide a positive or exact duplicate of the pavement surface texture.

The positive casts were photographed in the laboratory for use in connection with evaluating the skid resistance test results and to preserve a record of the surface characteristics of the sections tested. A few typical photographs of plaster cast positives are shown on this page.

An examination of these casts is often quite revealing as it is evident that surface textures are often very similar even though the appearance of the road surface has given rise to the belief that marked differences must exist.

These casts are one more tool permitting the engineer to base comparisons on evidence free from many factors that distort visual impressions.



Shasta Lake

Effect of Recreational Activities On the Redding-Yreka Highway

By H. CLYDE AMESBURY, District Traffic Engineer

When the construction of Shasta Dam necessitated the rerouting of U. S. 99, the Redding-Yreka highway, the cost of the job and the magnitude of the undertaking, rather overshadowed some secondary features. One of these was the public attraction based on the fishing which has developed in the reservoir. From experience with other dams, the Bureau of Reclamation was able to foresee that the dam itself would be a center of interest. Fishing just didn't register along with multimillion-dollar dams and powerhouses and rerouting of railroads and highways.

When the matter of fish in the reservoir was discussed with the Fish and Wildlife Service, its experts were not too hopeful. They said they didn't think the water would support enough feed to sustain a large fish population.

Just what happened to confound the experts, we do not know, but the fish are there. In the Sacramento, McCloud and Pit Rivers, prior to their being submerged in the reservoir, there were rainbow trout, suckers, pike and carp. There were even a few sunfish and catfish. Considerably above the reservoir area there were black bass in the Pit. Undoubtedly some of these bass came down in the high water.

The first year the reservoir contained water, wonderful fishing for rainbow developed just where the rivers encountered the quiet water behind the dam. This appeared to have resulted from an accumulation of the fish from the flooded streams. After they were caught out, fishing slumped.

Then an irrigation district down in the valley decided to drain its reservoir. The hundred or two black bass were moved to Shasta Lake. The State Fish and Game Department also made one or two moderate-sized plantings. It appeared as though nothing had happened.

Then in the fall of 1950, some fishermen trolling for trout caught some bass. In the following spring, fishermen





UPPER—One of boat houses on Shasta Lake. LOWER—Black bass taken in lake.

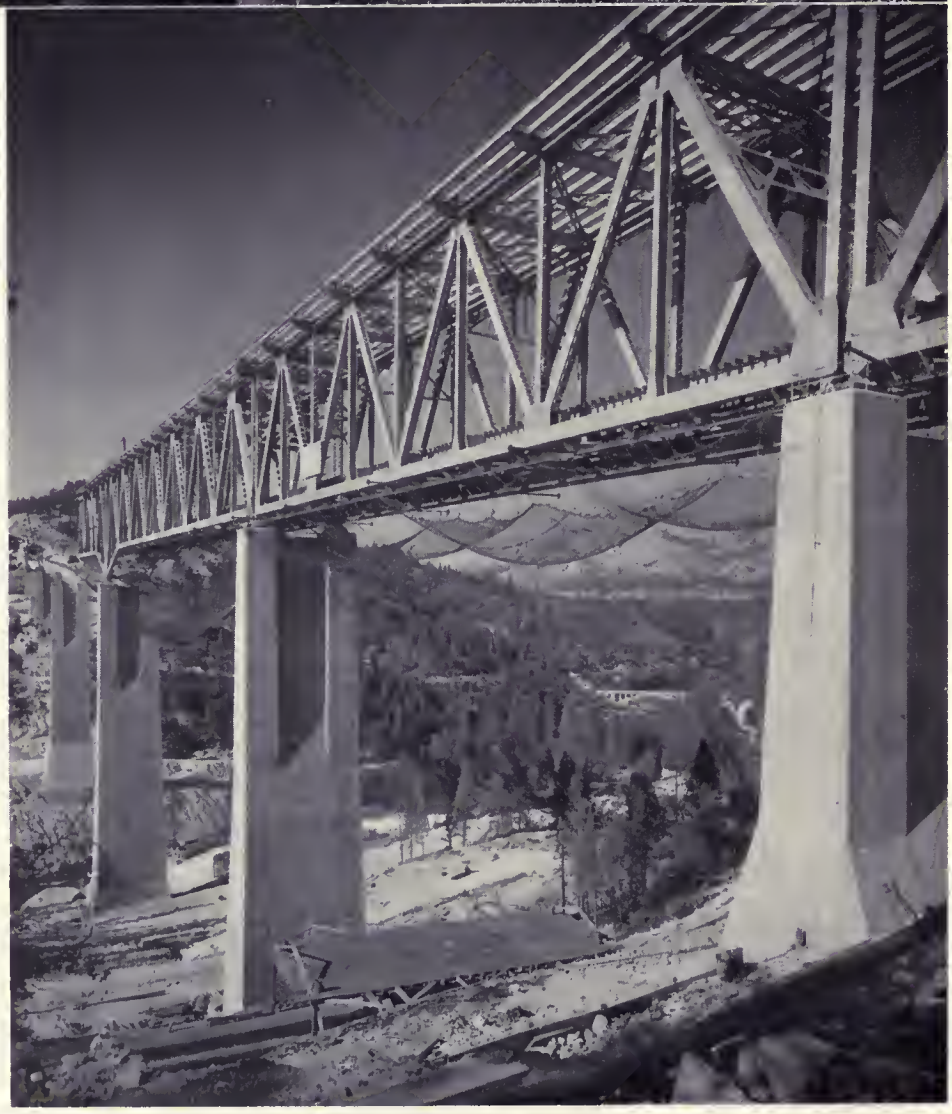


began to work the shore and coves and discovered lots of bass. It appeared that the young suckers, pike and carp had really provided rations for the bass. Of course, the bass is not a particular feeder. What he wants is quantity; minnows, frogs, insects, small snakes and even small birds that get near the water, all impress him as just items on his menu. He has no prejudice against dining on any other bass that is a little slow on acceleration and is small enough for him to swallow. When he is feeding, he just doesn't know his capacity. Frequently a bass is taken with the tail of a fish too large to be swallowed protruding from his mouth. Still he bites a lure.

This year the bass fishing has been a revelation. Almost everyone who goes up to the lake and uses live bait gets fish. A little later various plugs will probably be fully as effective, especially with the more skillful fishermen.

However, something else has occurred that is likely to have a great effect on the fishing. The full impact is not yet apparent but it has developed far enough to give a good inkling of future prospects. Rumors of huge trout caught in Lake Pend Oreille in Idaho began to filter down to Redding. They were called Kamloops. Investigation revealed that they were a subspecies of rainbow, practically devoid of any in-

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UPPER—Stream view of Pit River Bridge. LOWER—Bridge during construction. River is between third and fourth piers. Old span in background.

Forbes Overhead

Another Redwood Highway Project Is Completed

By C. W. SCHEMEL, Resident Engineer

Upon completion in late September of the current contract between Forbes Overhead, north of San Rafael, and Ignacio, a distance of 5.4 miles, another section of limited access modern highway replaced the last link of three-lane road on the Redwood Highway in District IV.

The area of lower Marin County traversed by this project has been primarily devoted to dairy farming for many years, but because of its proximity to San Francisco and due to the rapid increase in population in the Bay area, it is rapidly developing into suburban home subdivisions.

The Air Force Base at Hamilton Field lies immediately to the east of the project and its large civilian and military personnel added to those who have made their homes in the area, creates a peak hour commuter traffic that has heavily overtaxed the existing facility.

Increased Traffic Flow

As an indication of the increased traffic flow in this area, the July, 1951, count was 2.5 times that of July, 1938, when the three-lane section was built.

While this route serves the Redwood Empire as well as the Pacific Northwest, the recreational areas of the Russian River and other resorts in the North Bay make easy one-day trips from the San Francisco metropolitan area across the Golden Gate Bridge attractive. Rapid subdivision and housing project development in lower Marin County contributes heavily to this traffic flow, the 1951 Sunday average being 34,000 vehicles, and the 1951 Monday average being 21,555 through the length of this project.

This section was first paved in 1917 with a 15-foot wide, 4-inch thick portland cement concrete pavement; reconstructed in 1928 to a 20-foot by 8-inch concrete; and expanded to a 3-lane, 33-foot roadway by the addition of a 13-foot concrete strip in 1938.

Future Development

The present contract provided for the construction of a 24-foot 4-inch plant-mix surfacing on eight inches of cement-treated crusher-run base over six inches of selected material, with 10-foot outside shoulders and 5-foot inside shoulders.

This construction lies west of the existing roadway with a variable width division strip separating opposing lanes of traffic, the separation between pavement edges throughout most of the length being 46 feet, thereby allowing room for future development to a six-lane divided highway.

Frontage roads are included in the project near Ignacio, at Hamilton Field, and near the southerly end of the project where roadside development justified these requirements.

Twin bridges at the county road intersection at Lucas Valley provide for traffic interchange without conflict, while channelization, signals and illumination provide traffic protection to the military base at Hamilton Field.

Considerable slowdown and delay was encountered on this project due to the heavy rainfall during the winter of

Frontage road one-fourth mile north of Forbes overhead





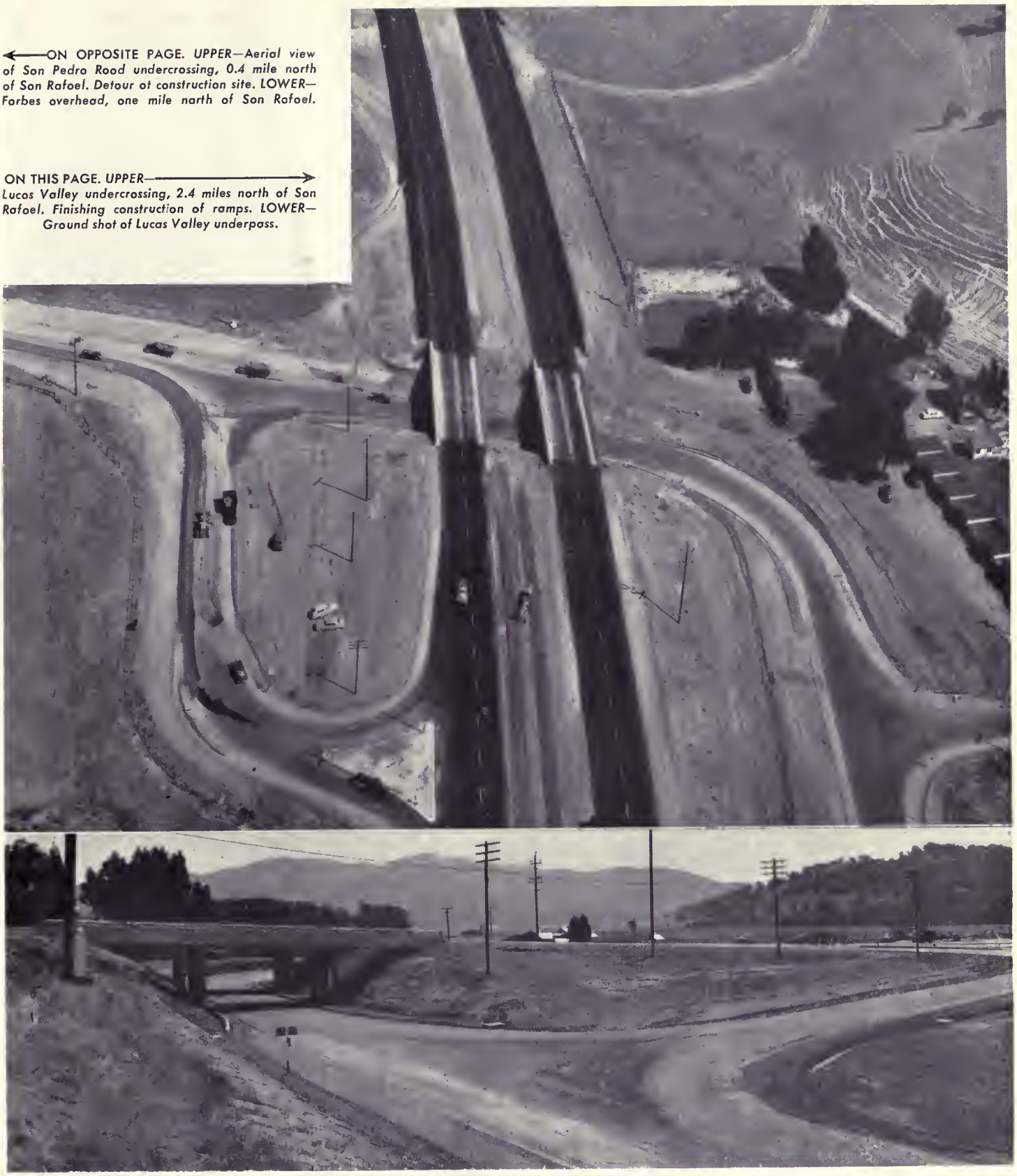
1951-1952 when over 55 inches were recorded, and high ground water delayed resumption of work until late spring.

A parallel bridge over Miller Creek and numerous culvert installations and underdrains were installed as part of the project.

Additional right of way was acquired for the project, developing a right of way width of 200 feet, plus additional widths for frontage roads at

←——ON OPPOSITE PAGE. *UPPER—Aerial view of San Pedro Road undercrossing, 0.4 mile north of San Rafael. Detour at construction site. LOWER—Forbes overhead, one mile north of San Rafael.*

ON THIS PAGE. *UPPER——————→ Lucas Valley undercrossing, 2.4 miles north of San Rafael. Finishing construction of ramps. LOWER—Ground shot of Lucas Valley underpass.*



strategic locations. Access rights to abutting properties were secured in these negotiations limiting access to controlled points along the route. A right of way plus right of way clearance costs for the project total $620,000.

The work was financed with state gas tax and federal aid funds at a construction cost of $1,140,000, exclusive of right of way and right of way clearance costs.

. . . Continued on page 49

DUBLIN BY-PASS IS NEARING COMPLETION

By J. H. SMITH, Resident Engineer

RECONSTRUCTION of U. S. 50 as a four-lane divided highway from Mountain House through Altamont Pass and on beyond Dublin is being realized.

The first four-lane divided highway project on this route in District IV was constructed between Greenville and the Mountain House in 1938. During the years of World War II, it became increasingly evident that the inadequacy of the remainder of the route required early attention. In March, 1944, application was made to the federal agencies for authority to begin construction on a section 13.4 miles in length between Greenville and Dublin. This application was denied by the War Production Board on June 16, 1944, on the grounds that construction of this project would seriously disturb the manpower situation in this locality.

Work Began in 1948

During the period between 1944 and 1948, planning of this improvement was continued and when materials and manpower was available, work began in 1948 on the 5.8-mile section between Greenville and 1.5 mile west of Livermore. This section was completed in September, 1950, and is locally known as the Livermore By-Pass.

In May, 1950, a section between the westerly terminus of the previous work and Hopyard Road was under way, being completed in August, 1951.

The most recent 4.6-mile section of this route from Hopyard Road westerly, is now under contract at a construction cost of $1,500,000 and should be completed for traffic this fall. When completed, this will eliminate all two-lane highway between the San Francisco Bay area and the entrance of the San Joaquin Valley, providing a continuous four-lane divided highway from Mountain House to a point 2.5 miles west of Dublin, a total distance of 23.4 miles.

Additional sections of freeway westerly of that now under construction are on the drafting tables and are scheduled for contract as rapidly as they can be financed. As planned, this ultimate construction will connect with the Eastshore Freeway at the Washington Avenue interchange in San Lorenzo.

Aid to National Defense

In addition to heavy passenger car traffic, this route carries a very heavy truck and bus traffic as it serves as a primary route between the metropolitan bay area and the San Joaquin Valley and points east.

The reactivation of Camp Parks as the Parks Air Force Base and the construction of an Atomic Research Laboratory in the Livermore Valley increases the importance of this route as an aid to national defense and military needs as may be required.

These federal installations have promoted a heavy influx in population, resulting in a proportional increase in traffic volume. The present construction will alleviate this traffic congestion.

A line change located southerly of the old route on direct alignment between Hopyard Road and the intersection of Route 5 and Route 107 eliminates a two-lane bottleneck between Hopyard Road and Dublin. The old route was particularly hazardous because within its limits there are two narrow bridges located on curves having small radii and poor sight distance which as a contributing factor have contributed to numerous accidents in the past. These two bridges which cross the Alamo and Amador Creeks are also inadequate to permit the flow of water during peak floods. As a result, the hazards involved become more acute as a portion of the old roadway between these bridges becomes inundated during heavy winter storms. The new alignment to the south will entirely eliminate this condition. Maximum grade within the above limits is 1.52 percent and the minimum radius curve is 4,000 feet. Westerly from the intersection of Route 5 and Route 107 near Dublin, the roadway departs from the relatively flat valley lands and begins to climb into the hilly and rugged sections of the Dublin Canyon.

New Alignment

The new alignment intersects the old alignment at the summit of Boehmer Hill, resulting in a grade change of minus 15 feet in elevation on the old alignment, which provides for a greater sight distance.

A continued line change northerly of the existing route is carried to the west limits of the project. The maximum gradient as constructed on this section is a plus 3.36 percent grade with curves having a minimum radius of 2,005 feet.

This new alignment involved many heavy cut and fill sections, the maximum heights being 55 feet and 45 feet respectively.

A portion of the existing roadway near the west terminal of the present

LIKE OUR HIGHWAYS? THANK THE BIKE

If the automobile wishes to boast that it is responsible for the fine quality of today's highways, all well and good. But if we're going to be really honest about giving credit where it is due, an appreciative word for the bike.

"The bicycle, which was to plant an early seed of desire for better roads, appeared in sizeable numbers in 1877," the American Society of Civil Engineer's Centennial Convention was reminded by Rex M. Whitton. As Chief Engineer of the Missouri State Highway Commission, Mr. Whitton is concerned with providing good passage for automobiles, but in so doing he does not overlook the part the bicycle played in road improvement thinking before there were horseless carriages.



UPPER—New alignment one mile west of State Route 21 and Dublin. LOWER—New construction in same area.



Heavy equipment working on construction one mile west of State Route 21 and Dublin

contract was planned to be utilized as eastbound lanes. This was accomplished by restriping and applying a three-foot width class "C" medium seal coat on the edges of the existing 30-foot PMS pavement; thus making two 12-foot lanes with three-foot improved shoulders.

The freeway pavement is portland cement concrete construction, which provides two 12-foot traffic lanes in each direction, divided by a 42-foot median strip from Station 393 to 511+50. From 511+50 to 590 the median strip is of variable widths. Westerly from Station 590 to the end of the project (Station 625+75) the traffic lanes are divided by a 34-foot median strip.

Limited Freeway

The precipitous nature of the terrain westerly of the intersection of Routes 5 and 107 on the new northerly alignment limits access to effect a limited freeway. There is an average difference in elevation of 45 feet between this new alignment which will carry westbound traffic and the existing alignment which will carry eastbound traffic.

Further, the nature of this terrain, especially in heavy cut and fill sections, presented an acute erosion problem. This was compensated for by seeding these slopes with barley and western rye grass seed.

On the present contract some 415 feet difference in elevation is encountered in approximately 3.5 miles distance. This rise in elevation was also in a westerly direction.

Intersections at Grade

Illuminated channelizations at grade are provided at Hopyard Road and Route 5, Route 107 and Route 5, on-ramp, and at the Old Dublin Road (County Road No. 35) and Route 5. The first two intersections are lighted by using incandescent group replacement lamps.

The structural typical cross-section of the freeway pavement consists of eight inches portland cement concrete upon four inches cement treated subgrade upon 12 inches imported base material. In all cut sections, six inches of imported base material upon six inches of imported pervious subbase material was placed in lieu of the 12 inches imported base material. This blanket of pervious material was placed to provide drainage for any subsurface water which may be encountered.

Grading Equipment

The contractor elected to use a fleet of 10 Caterpillar DW-20 jeeps and scrapers, supplemented by five Caterpillar DW-10 jeeps and scrapers, and several Caterpillar D-8 bulldozers with scrapers.

The DW-20 units were highly efficient in the valley section for hauling and placing embankment, as they can carry an estimated load of 20 cubic yards at a maximum speed of 26 miles per hour. After pioneering was done in heavy cut sections by D-8 dozers, the DW-20 units went on to further prove their versatility and efficiency in hilly terrain.

Major Construction Items

Major construction items on the present contract include 845,000 cubic yards of roadway excavation; 4,020 cubic yards of concrete removal; 21,000,000 station yards of overhaul; 195,000 tons of imported base material; 105,700 square yards of mix and compact cement treated subgrade; 3,394 barrels of portland cement for cement treated subgrade and base; 10,800 tons of plant-mixed surfacing; 24,069 cubic yards of PCC pavement; and 968 cubic yards of Class "A" structure concrete.

There was also 3,290 feet of cast-in-place concrete piling, and 14,448 linear feet of 6" perforated metal pipe.

The project is financed with state gas tax and federal aid funds.

Construction was under the supervision of Assistant State Highway Engineers Col. Jno. H. Skeggs and his successor, Assistant State Highway Engineer B. W. Booker, and Assistant District Engineer R. P. Duffy.

The resident engineers were the late Edwin Carlstad and his successor, J. H. Smith. R. F. Calou was general superintendent for the contractor, Fredrickson and Watson Construction Company.

PUBLIC ROADS OF THE PAST

"Public Roads of the Past, 3500 B.C. to 1800 A.D." is the title of a new publication of the American Association of State Highway Officials. The paper-bound, 101-page volume is a reprint of a series of popular articles which originally appeared in the official AASHO magazine *American Highways* under the by-line of "The Old Roadbuilder." The new volume reveals that "The Old Roadbuilder" is Albert C. Rose, veteran highway engineer in the Northwest and historian of the U. S. Bureau of Public Roads.

The articles are the result of intensive research on the part of Mr. Rose, who became interested in the history of roads and road building technique early in his career. He brings a freshness and enthusiasm to his subject which has made easy and informative reading for layman and engineer alike.

Some of Mr. Rose's interest-getting chapter headings are "How the Road Got Its Name," "The Oldest Road in the World," "The Queen of Them All" (which, it turns out, is the Appian Way built by the Romans in the third century B.C.), "Our Right Hand Rule of the Road" and "How Automobile Type Names Were Derived."

The chapters are illustrated with reproductions of 109 paintings and sketches prepared by artist Carl Rakeman. Each painting was preceded by exhaustive research and both author and artist believe them to be accurate in every detail. The last five pages contain an extensive bibliography.

Copies are priced at $3 and may be obtained from AASHO, 917 National Press Bldg., Washington 4, D. C. A second volume of "Public Roads of the Past," which will include others of Mr. Rose's articles in "American Highways" dealing with American road development from 1800 to the present, is being planned.

Precedent

First Pre-stressed Highway Bridge Planned for Fresno

By THOMAS J. BEZOUSKA, Junior Civil Engineer

THE CITY of Fresno will soon have the first pre-stressed concrete highway bridge in the State designed for heavy traffic loading. Known as the Weber Avenue Overcrossing, it will be located over the east approach to the Belmont Avenue Underpass in the City of Fresno. The proposed structure is to carry traffic southbound on Weber Avenue over U. S. 99 and Belmont Avenue traffic in order to permit elimination of one phase of the existing three-phase traffic signal system. At this point, just north of the central district, Belmont Avenue runs under the Southern Pacific Company tracks and carries more than 14,000 vehicles per day. Farris Avenue and H Street flow into Belmont, and Weber Avenue cuts across the intersection. (*See illustration.*) The total traffic entering this five-point intersection is 29,000 per day. This has been called "Fresno's worst bottleneck."

Costs Kept to Minimum

Since a limited amount of money was available for the project, it was necessary to keep costs to a minimum. The relocated portion of Weber Avenue was to be kept as short as possible, and the approach grades were to be kept as flat as possible to reduce the additional amount of right of way that would have to be acquired. At the same time, a minimum clearance of 14 feet 4 inches had to be maintained over Belmont Avenue. For these reasons it was essential that the structure depth be held to a reasonable minimum. In addition it was stipulated that traffic through the existing underpass could not be obstructed during construction of the new structure. This meant that the new bridge had to be of such a type that falsework would not be required. Another requirement was that the existing gravity type concrete retaining walls on either side of the underpass be used as abutments for the new structure if at all possible.

Choice of Three Types

These considerations limited the choice of structure to one of three types: a steel girder span with cast-in-place concrete deck; precast, conventional reinforced concrete girders with cast-in-place concrete deck; or a precast, pre-stressed concrete girder span with bituminous wearing surface.

A rough design of each of these three types was worked out by the Bridge Department with the following results:

Steel girder span	Structure depth—3′-10″
Precast, reinforced concrete	Structure depth—4′- 8″
Precast, pre-stressed concrete	Structure depth—3′- 4″

On the basis of unit prices assumed the pre-stressed span was apparently the cheapest of the three. It also showed an appreciable saving of both steel and concrete. One pre-stressed girder weighed 10,000 pounds, less than one reinforced concrete girder and the whole superstructure weighed 125,000 pounds less than the precast reinforced concrete girders with the cast-in-place deck.

Design of Bridge

This, of course, made it that much easier to adapt the gravity walls mentioned earlier for use as abutments.

For the foregoing reasons it was decided to design the bridge superstructure in pre-stressed concrete.

The bridge, skewed 41 degrees right, is 22 feet wide between curbs, and has a 6-foot sidewalk on one side with a 1-foot 9-inch safety curb on the other. It is 66 feet 9 inches center to center of bearings and about 70 feet long over-all. The 10 girders are modified T sections 36 inches deep. The top flange is 36½ inches wide, the bottom flange 16 inches wide, and the web is 6 inches thick. The flanges vary in thickness from 4 inches at the edge to 6 inches where they join the web. (*See illustration.*)

The girders are to be cast in a working yard, prestressed longitudinally, and then hoisted into place. A small space is to be left between the girder flanges and ends of diaphragms which will be filled with mortar. After five days the five diaphragms will be prestressed. The girders will weigh about 18 tons apiece. Just for comparison, it might be mentioned that the 113-foot girders for the Arroyo Seco pedestrian bridge in Los Angeles (California's first prestressed concrete bridge) weighed 50 tons apiece, and the 160-foot girders of Philadelphia's prestressed concrete Walnut Lane bridge weighed 160 tons apiece. Although the span is relatively short, the Weber Avenue structure is designed for a heavier highway loading than Walnut Lane.

Pre-Stress Force

The longitudinal prestress force that will remain in each girder after all losses due to shrinkage and creep in the concrete and creep in the steel have taken place will be 312,000 pounds. This will require an initial force of about 367,000 pounds since a loss of 15 percent in the initial force was assumed in the design. The initial force in the diaphragms will be 85,000 pounds. The concrete, containing seven sacks of cement per cubic yard, is to have an ultimate strength of 4,500 pounds per square inch, and a working stress of 1,500 pounds per square inch. If wires are used, the high tensile strength steel is to have an ultimate strength of at least 200,000 pounds per square inch and a working stress of 60 percent of the ultimate. If steel bars are used, the steel is to have an ultimate strength of at least 155,000 pounds per square inch and a working stress of 94,500 pounds per square inch.

Compressive Strength

It is interesting to note that there will be a compressive stress of about 2,000 pounds per square inch in the bottom fiber under initial prestressing force. This stress will quickly diminish to 1,700 pounds per square inch, and



Artist Van der Goes, Bridge Department, Division of Highways, visualizes Weber Avenue overcrossing when construction and landscaping are completed

under full dead load will be slightly more than 1,400 pounds per square inch. Under full design load—dead load plus live load plus impact—there will be no tensile stress in the bottom fiber. Since this compressive stress of 2,000 pounds per square inch is a temporary one and can never recur under any condition of loading after the bridge is put into use, it is considered quite satisfactory. Another interesting peculiarity of these prestressed girders is that they rise three-fourths inch at the midpoint of the span under the initial prestressing force. They are so stiff that even under full design load they retain a slight upward deflection.

Five Prestressing Methods

There are at least five generally recognized prestressing methods in common use, and these girders were designed so that any of the methods of post tensioning could be used at the option of the contractor. This presented quite a problem in itself, since the number of prestressing units—individual bars or cables consisting of groups of wires—could range from two to nine.

A particularly difficult problem to solve in the design of this bridge was that of choosing a girder cross-section. There was an almost infinite number of possibilities. For instance, how thick should the web be? Why 6 inches? Why not 8 inches, or 10 inches? How wide should the bottom flange be? Why should it be wider than the web in the first place? Fortunately, the width of the top flange was more or less fixed by the over-all width of the bridge, but all of the other dimensions could be varied at the discretion of the designer. The only way to answer these questions is to design a number of different sections and compare the amount of steel and concrete required by each. When a promising cross-section is discovered, it is then possible to refine it slightly until the most economical section of that type is

found. It is not claimed that the girder section chosen was the most economical one possible, but of all those sections tried, this one showed the lowest cost based on the unit prices assumed for steel and concrete.

T Beams

It has been the Bridge Department's experience that in reinforced concrete T beams and box girders, for a given span, the shallower girder is generally more economical than the deeper one until an optimum depth to span ratio is reached. Under ideal conditions of alignment and balanced spans, the optimum depth-span ratio for continuous T beams is .065, and for continuous box girders it is .050. The three-foot-deep prestressed girders used in this bridge have a ratio of 3/66.75 or .045. Since continuous beams can be made shallower than simply supported beams of the same span, it is obvious that the prestressed girder depth-span ratio for continuous spans could be even less.

In prestressed concrete, because of the various combinations possible of stem and bottom flange width, the optimum depth-span ratio is not constant. For instance, another, slightly different cross-section considered had an economic depth-span ratio of .037. This would have permitted a girder depth of 2 feet 6 inches for this span, but would not have resulted in a more economical girder. The 6-inch saving in structure depth would have lowered the approach grades and saved fill material. However, the extra concrete and steel used, the greater difficulty in forming and casting the girders, and the increased weight of the girders would probably have offset the saving in the cost of the approach work.

Prestressed Concrete Girders

In general, prestressed concrete girders can be built with a depth-span ratio as low as .033, but this extremely shallow section requires ideal conditions and will not be the most economical as far as the cost of the superstructure alone is concerned. Prestressed concrete has the great advantage of allowing extremely shallow sections to be used where minimum structure depth is the most important consideration.

Other prestressed concrete bridges in this Country have been designed using a safety factor based upon the ultimate strength of the structure, that is, the load that will cause actual failure. A commonly used factor is 1.0 dead load plus 4.0 (live load plus impact), or 2.5 (dead load plus live load plus impact). In general, however, if the structure were loaded almost to failure, the yield of the steel would be so great that upon removal of the excessive load, the structure would no longer function as a fully prestressed unit. Therefore, this structure was designed on the basis of what may be called "ultimate carrying capacity."

This is defined as that load which does not cause stresses in the concrete to exceed the ultimate strength, or the steel stresses to exceed the "proportional limit" of the steel.

Proportional Limit

The "proportional limit" may be a little difficult to determine exactly, but it can be determined sufficiently close for practical purposes by finding the point where the stress-strain diagram leaves a straight line. The "ultimate carrying capacity" is to be sufficient to provide for 1.0 dead load plus 2.4 (live load plus impact). The live load plus impact is to be distributed across the roadway width. In the design the "proportional limit" was assumed to be 150,000 pounds per square inch, which is considered conservative. At this stress the girders will carry 1.0 dead load plus 2.7 (live load plus impact). The concrete compressive stress in the top fiber is only 2,400 pounds per square inch at this time. On the basis of ultimate strength the failure load of the girders would be 1.0 dead load plus 4.6 (live load plus impact) or 2.6 (dead load plus live load plus impact).

Test Girders Not Necessary

Because of the more than adequate safety factor inherent in the design, because of California's experience with the Arroyo Seco bridge, and because of the experience accumulated by other states, it was felt that test girders would not be necessary. It is believed that prestressed concrete design has progressed to the point where it can be relied upon without the necessity of proving itself each time a new structure is being contemplated. After all, steel or reinforced concrete beams are not tested to destruction every time a bridge is built.

In the past contractors have apparently been hesitant about bidding on prestressed jobs due to their unfamiliarity with this new technique. Now, however, it is felt that prestressing is reaching the stage where it will be accepted as just another one of many familiar construction methods. Those familiar with the unique properties of prestressed concrete do not claim that it is going to replace steel or reinforced concrete as a building material. They do believe that under certain conditions it is a material that can do the job economically, as in this bridge.

APPRECIATES HELP

Modesto, California

San Francisco-Oakland Bay Bridge
Oakland, California

DEAR SIRS: While coming home from San Francisco via your bridge last night I had a clogged gas line and was forced to stop on your bridge. While I was trying to clear the line your Mr. E. Souza drove up in the service car. I wish to commend your department for having such fine men for Mr. Souza was very helpful in seeing that I was able to get on my way without endangering traffic on the bridge.

I visit San Francisco often and cross your bridge many many times but this is the first time that I have ever contacted one of the men that keep the traffic flowing. It's indeed a pleasure to know that when motorists are in distress on your bridge they will be well taken care of by your department.

I want to express my thanks to Mr. Souza again and your department for having men of such fine caliber.

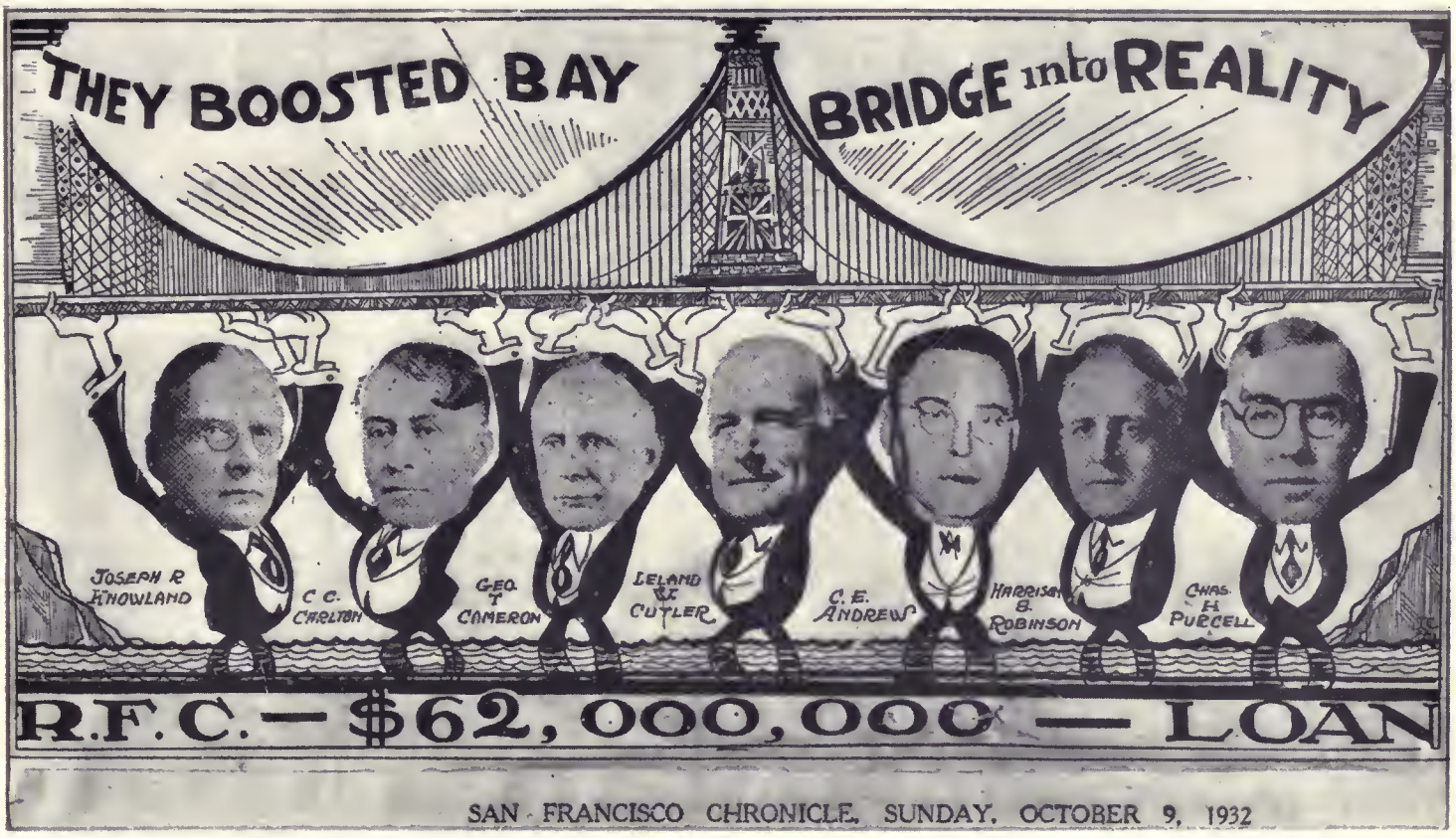
Very truly yours,

GEO. C. SUE, D.C.

LIGHT UP AND BE SEEN

The light tans and similar colors of today's automobiles often blend with tawny hills and other background colors of the countryside. For this reason some motorists turn on their lights to assure being seen by opposing traffic when pulling out to pass, reports the California State Automobile Association.

FAMOUS BAY BRIDGE FINANCED TWENTY YEARS AGO



TWENTY years ago, October 8, 1932, was the date when California was electrified by the news that the Reconstruction Finance Corporation, during the administration of President Herbert Hoover, had agreed at its meeting in Washington, D. C., to finance the proposed San Francisco-Oakland Bay Bridge by the purchase of $62,000,000 of revenue bonds to be issued by the California Toll Bridge Authority.

For a number of weeks a committee composed of Harrison S. Robinson and Joseph R. Knowland of Oakland and George T. Cameron and Leland W. Cutler of San Francisco, together with the late Charles H. Purcell, then State Highway Engineer, C. E. Andrew, State Bridge Engineer, and C. C. Carleton, Chief Attorney for the California State Department of Public Works, had presented their case on the application of the State of California for a loan and on Saturday, October 8, 1932, the delegation then present in Washington was informed that its mission had been crowned with success.

The action by the Hoover Reconstruction Finance Corporation had sprung the barrier that released the huge enterprise, the building of the world's longest bridge.

It is interesting to note that in the short span of 20 years since the bridge construction began (it was opened for public travel November 12, 1936) the traffic has far exceeded the original estimates when the loan was granted; and a second crossing has now become a pressing need.

Grade Separation

Continued from page 22 . . .

single bridge structure. The Hollywood Freeway and the Harbor Freeway-Arroyo Seco Parkway intersect at approximately right angles. The Hollywood Freeway is on the top level, the Harbor Freeway-Arroyo Seco Parkway on the second level, with two pairs of interchange roadways occupying the lowest level and the third level. In this manner all the necessary traffic movements are adequately provided for with a minimum amount of turning movements.

A model of the now famous structure built by Elrod Bradt with the help of H. Dana Bowers and M. R. Blacow is being extensively exhibited in Southern California and is attracting considerable attention. Bradt, who was in the Bridge Department, Division of Highways, now is in the Design Department. Bowers is Landscape Engineer and Blacow is his assistant.

THE POLITE THING

Little courtesies you show in social circles may win you new friends. Little courtesies on the highway may save your life.

Early Days

Minutes of First Highway Commission In 1912 Make Interesting Reading

By R. C. (CASS) KENNEDY, Secretary, California Highway Commission

(Continued from last issue)

On April 23, 1912, at 10 o'clock a.m., the commission met and Commissioner Darlington reported that it had convened in regular session in Los Angeles in the Union Oil Building on April 15th, 16th, and 17th. He stated that on April 15th the commission listened to a Chowchilla and Brawley delegation. On April 16th, heard delegations from Imperial Valley, the Foothill Boulevard Association, a Chula Vista group, a Santa Paula committee, and the Ontario Chamber of Commerce. On the 17th, hearings were accorded the Oxnard Board of Trade, a delegation from Antelope Valley, one from Ventura County, and groups from Orange County and Santa Monica, which urged the adoption of a route along the so-called "All-Level Route" from Los Angeles to Santa Ana by way of Huntington Park and Norwalk.

Commissioner Darlington further reported that on the morning of April 18th the commissioners left Santa Barbara for Gaviota, Las Cruces, Santa Ynez Mission, Los Olivos and Los Alamos, returning by way of Lompoc, Las Cruces and Gaviota to Santa Barbara. They also made an examination of Ortego Hill.

They returned to Los Angeles, leaving there Friday night, April 19th, and arriving in Fresno on Saturday, April 20th, where they met representatives from Tulare and Kings Counties regarding highways in Tulare County and in Kings County.

Headquarters Leased

On the evening of April 23d, the commission reconvened in Sacramento where the Advisory Board ratified leases made for different headquarters at Sacramento, Redding, San Luis Obispo, and San Francisco. The Highway Engineer presented a report signed by F. G. Somner, of Division I, relative to that part of Route 1 which is north of Willits, and the commission voted that the Highway Engineer be requested to cause a survey, plans and estimates to be made in Division I of that portion of Route 1 in Mendocino and Humboldt Counties beginning at Willits and going all the way to Eureka. The commission also approved seven other routes for surveys and plans.

On the morning of April 24th, the commission met again and listened to a delegation from Siskiyou County and one from Shasta County. That took up all the morning, so it recessed until 2 o'clock that afternoon, when it gave orders to the Highway Engineer to cause a reconnaissance survey for a highway in Division III from Folsom in Sacramento County, to Placerville in El Dorado County.

San Francisco's Mission Street

It was also voted that Commissioner Blaney be requested to take up with the city authorities of San Francisco the matter of the improvement of Mission Street to the Ferry Building, and to urge upon the city authorities the necessity of the improvement of Mission Street as an essential link in the State Highway System. One must remember that in those days the state highway did not go through cities; that all city streets were built and kept in repair by the cities and not by the State.

That afternoon on the oral recommendation of the Secretary to the Commission, Miss Helen Simonton, employed as a stenographer at $100 a month, was promoted to Assistant Secretary at a monthly salary of $125.

At the meeting on May 20th, it was voted that the Highway Engineer be authorized to purchase all the necessary laboratory equipment for cement, oil and asphalt testing. It seems that the commission had obtained some room at the State Fairgrounds and had set up a small testing laboratory. Fred D. Maddox, of Oakland, was hired to be a testing engineer under the immediate direction of Mr. Osborne, a geologist.

Start of Highway System

On May 21st, the commission reconvened in regular session, voted approval of the recommendation of the Highway Engineer, dated May 15, 1912, that a portion of the proposed state highway between South San Francisco and Burlingame, about 5.4 miles in length, be designated as Division IV, Route 2, Section A, and that all the forms accompanying the recommendation for layout, advertising, receiving bids, and for contracting for the construction of the highway be approved.

That was the first state highway project put out to bid and to be done under the supervision of the new California Highway Commission. The commission also adopted a route in Division I, Route 1, Section A, which was between the southerly boundary of Mendocino County and Hopland, as a state highway; selected a road between Madera and Califa in Madera County as a state highway; and in Divi-

RECALLS EARLY DAYS

Stockton, California

Mr. Kenneth C. Adams, *Editor*

Dear Mr. Adams: As the first stenographer of the California Highway Commission I found Mr. Kennedy's "Early Days" most interesting, and I will very much appreciate being included on your mailing list for *California Highways and Public Works.*

Sincerely,

(Mrs.) Adria L. Harrison



Start of actual construction on State Highway Contract No. 1 was made in San Mateo County on August 7, 1912. In the group are Chairman Towne of the Highway Commission with shovel; W. J. Martin, South San Francisco; L. E. Aubury, Ex-State Mineralogist; Judge P. E. Lamb, Burlingame; Ex-County Recorder of San Mateo County, H. O. Heiner; Dr. F. C. McGovern; A. E. Ritchie, Fred Cunningham and Supervisor W. H. Brown, San Mateo County.

sion III, approved the proposed state highway between Morrison's Crossing and Marysville, being that portion thereof in Yuba County, about nine miles in length and designated as Division III, Route 3, Section B.

The commission also did a very important piece of business this day by recommending to the Advisory Board of the Department of Engineering that at least $2,000,000 of the $18,000,000 bonds be sold so that these jobs could be done.

Progress was being made. One must remember that on August 9, 1911, the California Highway Commission consisted of three men who had just been appointed. They didn't have an office; they didn't have a secretary; they didn't have a stenographer; they had a Highway Engineer, but they had nothing else to go by or to go with; and on May 21, 1912, they were able to adopt certain routes as part of the new State Highway System.

That afternoon the commission met again. It listened to a group from the Winters Chamber of Commerce and citizens of Davis regarding a highway between Woodland Junction and Vacaville.

That evening, it met at 8 p.m. and voted that bids for the construction of the sections of state highway in San Mateo, Mendocino, Madera and Yuba Counties, laid out this day, be opened at 2 p.m. on June 24, 1912.

First Bids Received

On June 24th the commission met at 2 p.m. and opened bids for the construction of certain sections of the new State Highway System. On a job in Mendocino County, from the Sonoma County line to Hopland, the bids ran from $67,000 plus to over $122,000 for the project. The engineer's estimate was $65,000. On a job in South San Francisco, in San Mateo County between South San Francisco and Burlingame, the bids ran from $89,000 plus to $128,000 plus. The engineer's estimate for this job was $96,000 plus.

Incidentally, the name A. Teichert & Son, of Sacramento, appears in the list of bidders on this job in San Francisco. This firm is still in existence, and is presently doing work on the Capitol Grounds in the way of landscaping. It has just finished a large contract for the Division of Highways in Piru Gorge on U. S. 99 in Southern California.

On the job from Madera to Califa in Madera County, the bids were opened and ran from $72,000 to $83,000, with the engineer's estimate at $66,000. There was another set of bids in Yuba County in Division III from Morrison's

Crossing to Marysville, and the bids in this case ran from $67,000 to $76,000. The engineer's estimate was $60,000.

At 3.30 that afternoon, the commission met again and Mr. Towne reported that the Advisory Board had O.K.'d all its acts up to the present.

Contract No. 1

On June 26, 1912, the commission met at 10 o'clock in the morning, listened to a number of delegations, and then proceeded to execute contracts with successful bidders for the construction.

Contract No. 1 was let for a section of state highway in San Mateo County, Division IV, Route 2, Section A (between South San Francisco and Burlingame) to F. R. Ritchie & Company of San Francisco. Contract No. 2 was for a section in Mendocino County between the Sonoma County line and Hopland, and was awarded to the General Contracting Corporation of San Francisco. Contract No. 3 was for a section of state highway in Madera County between Madera and Califa, and was awarded to the Ransome-Crummery Company of Oakland. Contract No. 4 was for a section of state highway in Yuba County between Morrison's Crossing and Marysville and was awarded to F. E. Frey of Sacramento.

Dick Wilson Employed

The commission met again on July 22, 1912. It is noted that one Richard H. Wilson, who resided at that time at Covello, was appointed and employed as a draftsman and computer attached to Division I, for the monthly salary of $85. This Richard H. Wilson is now affectionately known throughout the State of California as "Dick," and is Assistant State Highway Engineer in charge of Administration. Dick worked for quite a little while for the California Highway Commission and then left for greener fields in the State of Washington. After working in Washington for quite a while and serving in World War I, he came back to the Division of Highways as Assistant District Engineer. The return of Dick was on August 1, 1927. His employment has been continuous with the California Division of Highways since that time.

In July, the commission got quite a jolt. The attorney for the commission reported that the Attorney General's Office had orally ruled that the commission did not have the power to make the award of the four contracts as voted, and that the award of such contracts must be made by the Advisory Board at its next meeting.

It didn't take long to overcome this difficulty, as the commission adjourned to meet that afternoon with the Governor and the Advisory Board of the Department of Engineering. The Advisory Board passed a resolution making it lawful for the Highway Commission to award contracts.

There is a notation in the July 24th minutes about the refund of $172.50 which was sent back to the State Controller with a request that it be put to the credit of the State Highway Fund. It seems that this $172.50 represented compensation made by one Walter Holmes to the State of California for the fatal injury to a horse and damage to a camp wagon belonging to the State.

Publish Bulletin

On August 26th, the commission voted on the recommendation of Chairman Towne that the California Highway Commission publish a monthly bulletin recounting therein a record of the commission's acts; the same to be compiled by the secretary and approved by the commission. This was the start of our present *California Highways and Public Works* magazine. Copies of this original bulletin from that time to this are all on file in our State Library, and the editor has the complete file here. In looking at the first copy, the remarkable growth of the magazine is immediately apparent. It started out as a small publication with some illustrations.

On August 27th, Chairman Towne read a letter from Mrs. Cora B. Woodbridge of Roseville, later an assemblywoman, urging that the commission place itself on record in favor of the abolition of road signs upon the state highways. As you probably know, during the past year and a half there has been a concerted effort on the part of many people to eliminate billboards along our landscaped freeways. It would seem that even back in 1912 there were people who didn't want billboards alongside our state highways.

First Registration of Autos

On September 23, 1912, it was voted that the Highway Engineer and the attorney be requested to prepare a rough draft of the bill in regard to the registration of automobiles and the licensing of operators thereof. The receipts from these sources were to be used for the maintenance of the state highways. This was the start of our Department of Motor Vehicles.

On October 12th, it was voted that certain warning signs be adopted for erection in appropriate places at the expense of the State on all state highways under construction. There were three types of signs. Type 1 stated that the highway was under construction and there was positively no passing. Type 2 stated that the highway was under construction and that it was dangerous but passable. Type 3 stated that the state highway was under construction so many miles beyond this sign and to turn here.

And here begins the first of our road signs which now are standardized and upon which you, as a driver of an automobile, depend to get you places in the most expeditious manner.

Also, on October 22d, a letter was received from L. Sperbeck, of La Mesa, California, which enclosed a petition of the citizens of La Mesa asking that the highway be routed through that town. Since that time, in various meetings of the commission citizens of La Mesa have appeared before the commission to tell them how glad they are that the highway does not go through their town at the present time, and that they are better satisfied with Highway 80 going past the town rather than through it.

Start of Laboratory

In the middle of November, at a meeting of the commission, the Highway Engineer was authorized to request from the State Architect specifications and bids for a hollow tile building, approximately 16 feet square, for the use of the Geological Department of the division. This building was to be erected on the State Fairgrounds and was to be substantially in accordance with the sketch submitted to the

commission by the State Architect. This was the beginning of our Materials and Research Laboratory. If this building was to be 16 feet x 16 feet, it would give approximately 256 square feet of laboratory. At the present time, the Division of Highways laboratory has 25,000 square feet of floor space, and is crowded. We have about 200 square feet per employee at the present time, and the standard for employees and laboratories is 650 square feet.

The Board of Control asked the commission for a statement of its financial condition, and also wanted a statement of the amount necessary to carry the work along until March 15, 1913. The Highway Engineer was requested to prepare such a statement.

Record was made at this meeting of the receipt of a letter from W. B. Hogan, Assistant Engineer of the Highway Maintenance Department of San Joaquin County at Stockton. He called the attention of the commission to the importance of considering and devising means for the protection of improved highways from damage caused by heavily loaded and narrow-tired wagons, and recommended that this subject be taken up by the State so that the Legislature might be induced to make the necessary general laws in the premises. Evidently some engineers were looking a long way ahead as to overloads and breaking up of our highways.

End of 1912

At the December meeting a Mr. Crummey, representing the Southwest Surety Insurance Company, appeared before the commission and requested an extension of time for the completion of Contract No. 1. This contract was originally awarded to F. R. Ritchie & Company and from the minutes one would gather that he couldn't complete it and the Southwestern Surety had taken on the Ransome-Crummery Company, of Oakland, to do the job. The request was referred to the Highway Engineer to submit a report with his recommendation.

This is the end of the minutes for the year 1912, and gives some idea of the trials and tribulations of the beginning of the California Highway Commission.

You must remember that in August, 1911, it started from scratch, and that in 17 months it was a going concern, with a sizeable organization and with a number of contracts let, and with the Highway Engineer authorized to make surveys for many, many more roads.

You may remember that in several instances we have stated that the Highway Engineer furnished lists of employees each month to the commission. This was with the exception of cooks and laborers and teamsters.

For the information of many, let it be said here that in the olden days of engineering, camps were established with cookhouses and tents for the engineers and the engineering parties. Nearly all of these salaries of $40, $50, $60, and $75 a month included board and room. By board and room, I mean a cot on which to sleep, and the board furnished by the State or the corporation for which the employee worked. These engineering camps were established due to the fact that they were sometimes a great distance from headquarters and suitable transportation, such as we have today, was woefully lacking.

In looking back over the record of 1911 and 1912, you can see that the Highway Commission had most of its meetings in Sacramento. However, it held meetings in Los Angeles and San Francisco, and individual members had traveled to several parts of the State to hear different groups of people advocating different locations of roads. Even back there the commission was, seemingly, very grateful to people who would express their opinions, as they are today.

(To be continued)

LIKES ROAD SIGNS

151 Fairlawn Drive,
Berkeley 8, California

Division of Highways
Sacramento, California

GENTLEMEN: A word of praise and thanks!

I recently did a lot of driving over unfamiliar roads alone with my two small children. I was constantly grateful for the excellence of your road signs and markings. They are an invaluable aid to safe driving.

Thank you.

MRS. J. V. K. HARGER

AND NOW LOOK AT ARROYO SECO FREEWAY

One of the great needs of the time is a fine thoroughfare between Pasadena and Los Angeles. Time and again projects of this kind have been started but have been defeated.

At present the roads between the two cities are nothing more than patchwork—desultory efforts here and there, and there is no continuous road which is in good condition.

No cities of such importance similarly situated with reference to each other have such poor connecting roads. They are rough, poorly kept and almost impassable at times.

Pasadena and Los Angeles should see that the necessary improvements are made without delay.—*Pasadena Star*, March 1, 1905.

AND NOW LOOK AT THE BAY BRIDGE

Ferry companies may now transport automobiles using gasoline as a motive power, allowing them to be driven on and off the boat under their own power, the only restriction being that the engine must be stopped while the boat is in transit. This news will be hailed with delight by the automobilists of California and especially those of this city. The local autoist in crossing the bay has been obliged to stop his engine at the ferry, get out of the car and push it on board, then the full length of the boat and up the approach at the other end of the ferry before the engine could be started.—*S. F. Examiner*, February 28, 1905.

W. B. BOGGS HONORED

Wallace B. Boggs, County Surveyor and Road Commissioner of Alameda County, has been appointed by Thomas H. MacDonald, Commissioner of the U. S. Bureau of Public Roads, to the Board of County Engineer Consultants.

The Board of County Engineer Consultants is composed of 10 nationally recognized county engineers, and their function is to advise the Commissioner of Public Roads on all matters pertaining to county roads, particularly regarding procedure, administration and techniques in the use of federal-aid secondary funds.

Cow Palace

New Highways Expected to Boost Attendance Again This Year

WHEN the thousands of animal enthusiasts from all over the Nation flock to this year's Grand National Livestock Exposition, Horse Show and Rodeo in the San Francisco Cow Palace, they will experience the best highway traffic situation in the history of the show.

This was disclosed by Nye Wilson, Secretary-Manager of the Cow Palace, after a conference with R. P. Duffy, Assistant District Highway Engineer, District IV, Division of Highways, San Francisco.

Principal improvements in the routes to the Cow Palace will be the almost certain completion of the freeway construction on Highway 101 from the Forbes Overhead north of San Rafael to Ignacio. Hundreds of exhibitors and thousands of spectators of the Grand National originate in the Redwood Empire and use Highway 101 to reach the Cow Palace.

Duffy told Wilson that the freeway construction from San Rafael to California Park will be still going on during the dates of the exposition but that there will be no impediments to the free flow of traffic. There will be two lanes open in each direction in this area, Duffy said.

New Highways Boost Attendance

Last year the Grand National was immensely benefited by the opening of the freeway overpass leading out of San Francisco on Bayshore Boulevard, Wilson told Duffy. This year's improvements on 101 north of San Rafael will also be a big help to the show, he said.

The Grand National, mighty combination of national livestock exposition, full division national horse show, official National and Pacific Coast Cutting Horse Association Championship Finals and the official Grand National Championship Rodeo Finals, will be held in the Cow Palace this year from October 31st to November 9th, inclusive.

Headlining the spectacular Arena Show this year will be the world's most famous and spectacular mounted drill troop, the Royal Canadian Mounted Police Musical Ride. This troop of 35 R. C. M. P. constables and officers was the smash-hit sensation of the 1939 Golden Gate International Exposition on Treasure Island, in San Francisco.

Features of Show

The Arena Show will be produced nightly, October 31st through November 9th, with matinees on Saturday and Sunday, November 1st and 2d and 8th and 9th. The arena entertainment show of the exposition alternates championship rodeo events with horse show classes, cutting horse competition and tanbark specialties. Other specialties in addition to the featured R. C. M. P. Musical Ride will be Buddy Heaton's famous clowning horse "El Rocco," the Pope Pony Hitch, working in conjunction with the huge six-horse draft teams of Raymond Church, Rio Vista,

Interior of San Francisco Cow Palace during a performance of the annual Grand National Livestock Exposition, Horse Show and Rodeo arena show





The Royal Canadian Mounted Police Musical Ride will be the featured attraction at the 1952 Grand National Livestock Exposition, Horse Show and Rodeo in San Francisco's Cow Palace, October 31st-November 9th. This division of the Royal Canadian Mounted Police is considered the world's most spectacular and famous mounted drill.

California, and the Coverly West Company of Shafter, California.

Slim Pickens, world's most famous and daring Brahma bull fighter, will again dare death on the horns of the most vicious of all cloven-hooved animals. Cy Taillon will be the announcer. Christianson Brothers of Eugene, Oregon, will furnish their famous bucking and riding stock for the rodeo events as primary contractor. Additional stock will be obtained from California stock producers.

Most of the 10,927 seats of the Cow Palace for each of the 14 arena show performances will be reserved. Choice mail order reserved seat tickets may be obtained by writing the Cow Palace, San Francisco 24, and enclosing a check or money order (no cash) and a stamped and self-addressed return envelope. Total prices for reserved seats are $2 and $2.50 and box seats $3.50.

Shasta Lake

Continued from page 32 . . .

hibitions in respect to size attained, and they had been brought from Kamloops, B. C. They were naturally voracious, otherwise they would not grow so large and so fast. In Idaho they had been caught up to 37 pounds in weight.

Imagine giving information like this to a bunch of fishermen who had a spot that they thought might be just what the Kamloops needed! Some of the enthusiasts dashed up to Idaho for a first-hand investigation. Others made the long trek clear up to Kamloops, B. C. There is no group of men from whom sanity takes flight as readily as from fishermen. That is, with the possible exception of hunters of deer, pheasant and duck.

Many Plantings Made

The reports were all favorable and a few eggs were obtained. The anglers were so certain of success that they even got some Kokanee eggs to be sure that the young Kamloops would have this small species of fresh-water salmon available for food when they got big enough to be on their own in Shasta Lake.

The government salmon hatchery at Coleman was persuaded to hatch both varieties of eggs. The Kokanee and

. . . Continued on page 61

Forbes Overhead

Continued from page 35 . . .

Granite Construction Company at Watsonville was the contractor.

The work was started in January, 1951, under the general supervision of Assistant State Highway Engineer Jno. H. Skeggs, now retired, and is continuing under the direction of his successor, Assistant State Highway Engineer B. W. Booker, District Engineer (Operations) J. P. Sinclair and Assistant District Engineer (Construction) R. P. Duffy. As the Resident Engineer, the writer was assisted by Bridge Department representatives W. H. Jacobson and M. H. Jacobs.

Report on Progress and Records in Pavement Construction During 1951

By CARL ALZUETA
Assistant Engineer, Construction Department

Because of the continuous improvement in both equipment and "know-how," Standard Specifications for highway construction cannot remain "standard" for very long. The periodic revisions of the Standard Specifications issued by the Division of Highways are hardly off the press before new methods of construction and of processing materials are developed which make changes and additions necessary.

The result has been to increase the size of the special provisions which are prepared for each project since they must now include specifications which have become "stock" since the latest volume was issued in 1949.

Formal revision of the 1949 Standard Specifications has been going on since 1951. Field engineers throughout the 11 districts were canvassed for suggestions, as were the various departments at Headquarters Office. Correlating of the many suggestions and the editing of the text by both engineers and attorneys is taking approximately two years.

Some of the proposed changes in the Standard Specifications have been undergoing a trial. They are being inserted into special provisions to see how they work out in field practice before being inserted into the Standard Specifications.

The Construction Manual now in use, issued in 1950, is also being revised as a parallel operation. Instructions are being revised to keep abreast of current construction practices, materials and equipment.

SKID RESISTANCE

Among the significant paving developments during the year was a growing consciousness on the part of engineers of the problem of slippery pavements. It has become apparent that the problem will play an increasingly important role in the future and will influence construction operations as well as pavement mixture design. In conjunction with the University of California's Institute of Transportation and Traffic Engineering more than 140 sections of pavements have been studied and their skid properties noted. Current investigations are being made by the institute to determine the effect of various gradations of aggregates in bituminous mixtures and the effect of various types of construction equipment and procedures.

It is hoped that improvements can be made in the surface texture of bituminous surfacings to increase their skid resistance properties, and that this will eliminate any necessity for rock screenings seal coats for this purpose. This is important since problems have arisen from the attempt to place this type seal coat over newly laid paving mixtures. On several projects on heavily traveled routes, screenings which had been placed on the new surfacing were worked into the matrix of the mix. The newly placed mix had not had time to harden or for the volatile oils to escape. At other times, in an attempt to complete a surfacing contract in its entirety without suspending for the winter, serious seal coat failures have resulted. Such seals left without their cover material result in a glazed surface and constitute a skid problem.

The preferable policy for rock screening seals is to defer their placement until the need for such a seal is apparent.

PAVEMENT PROGRESS

Year	PCC PAVEMENT Class "B" Concrete: Average C.Y./day	PCC PAVEMENT Class "B" Concrete: Aver. Roughness Index inches/mile	PMS Aver. Roughness Index inches/mile	RMS Aver. Roughness Index inches/mile
1940	374	7.4	23.1	49.2
1941	460	7.8	19.3	29.4
1942	367	8.0	14.6	25.5
1943	337	14.2	18.8	23.4
1944	426	10.3	16.8	32.9
1945	236	14.2	19.5	31.2
1945-1949*	-----	-----	-----	-----
1950	662	6.3	11.2	23.1
1951	686	6.8	11.4	21.2

* No records were compiled in this period.

PORTLAND CEMENT CONCRETE

Methods of placing concrete pavement remained essentially the same as in the past; however, several changes were made during the year in specifications which will apply to future work.

One of the changes for this type of pavement is the introduction of the sawed weakened plane contraction joint. By substituting the cut joint it is hoped that much of the spalling characteristics of the premolded paper strip joints will be eliminated and will result in better riding qualities.

Cutting is tentatively planned for 8 to 10 hours after the placing of the concrete for those joints at 60-foot centers. Sawing intermediate joints will be delayed an additional 12 to 24 hours. It is anticipated that the cutting sequence will have to be adapted somewhat to each paving project to compensate for variable placing temperatures and other local conditions. Since delaying the sawing of the green concrete lengthens the life of the diamond saw and reduces spalling, sawing of the joints will be deferred until random cracking has become a limiting factor.



Concrete pavement recently completed on U. S. 99 just south of Turlock

An alternate method will be used to join the longitudinal and transverse contact joints by permitting the use of an unhooked one-half-inch steel reinforcing rod in addition to the present tie bolt assemblies.

Calcium chloride was used successfully during the year as an admixture for portland cement concrete to accelerate the early strength of the pavement. Added in flaked form to the mixer in percentages up to 2 percent, it may aid greatly in the early opening of the pavement to traffic. (This procedure was described in some detail in the March-April, 1952, issue of *California Highways and Public Works*).

The highest average daily production of pavement concrete was accomplished on Contract 1-10TC61-F, on Route 4, just south of Merced. Guy F. Atkinson was the contractor, and W. F. Fleharty and A. E. Conto, resident engineer and street inspector, respectively. An average daily output of 1,080 cubic yards was attained. The individual high for a single day's out-

Recently completed resurfacing of U. S. 40 near Vacaville with a bituminous mixture





This section of four-lane divided highway has a bituminous plant-mixed surfacing over a cement-treated base. Recent construction on Rosemead Boulevard in Los Angeles.

put is claimed, however, by N. M. Ball Sons for their production of 1,508 cubic yards in a 9½-hour day on Contract 1-6VC42 on Kern-4-C.

During the year, 68 miles of concrete pavement were constructed with an average roughness index of 6.8 inches per mile. The best riding quality was obtained by Fredrickson & Watson on Contract 52-5TC2-F, on Route 2 between Chualar and Spence Underpass, with a low of 5.6 inches per mile. R. H. Roberts was the resident engineer, with W. H. Melcher and R. W. Gainer as paving inspectors.

PLANT-MIXED SURFACING

Modification has been made in recent contracts with respect to plant control and quality of the mineral aggregate. These changes are forerunners of contemplated revisions of the present Standard Specifications.

The highest quality mix involves close grading tolerances and exacting quality requirements for the mineral aggregate and is intended for use on the major routes. A second type of surfacing which closely parallels the present surfacing would be specified for routes of a secondary nature.

The grading of the mineral aggregate for plant-mixed surfacing has been coarsened to produce a less dense paving mixture and to reduce the quantity of fines previously permitted. It is also hoped that the coarser grading will result in a better nonskid surface texture. In some instances this reduction in fines will mean that the aggregate will have to be washed, or as an alternate, portions of the natural fines will have to be wasted.

The trend continues toward higher daily production of surfacing material as mixing plants increase in capacity and methods of handling the stockpiles of the raw materials are improved. A few batch plants with a three-ton mixing capacity are now in operation in the State and other contractors have indicated their interest in such units.

The continuous mixing type plant has proved itself capable of producing very large tonnages of paving materials. Basich Bros. employed this type of mixer last year to achieve the highest average daily tonnage in the State. On their contract on Route 4 near Castaic they produced an average of 1,480 tons per day. R. E. Deffebach and F. E. Sturgeon were resident engineers on this project.

The special 5,000-pound sample weigh hopper now being required for this type of plant has added materially to the positive controls possible with this mixing method and has eliminated many of the previous objections to it. The use of this hopper enables the engineer to readily and accurately determine the quantity of each bin size being proportioned, as well as the total quantity of aggregate entering the pugmill. It also facilitates the sampling of each bin size.

As in previous years, plant mix continues as the predominating type of surfacing. It was specified on 83 percent of the higher types of bituminous surfacings completed under contract in 1951. A total of 409 miles of this type of surfacing was completed during the year.

The smoothness record for plant-mixed surfacing was made on Contract 52-1TC1 on Route 71 near Smith River in Del Norte County. Mercer-Fraser was the contractor and Ralph Harkness the resident engineer. The typical section for this highway consisted of a dense-graded plant mix over a cement-treated base, with a one-half-inch open-graded wearing course.

ROAD-MIXED SURFACING

A total of 87 miles of road-mixed surfacing were completed under contract during the year and of this total mileage 87 percent was laid in the dry, warm regions of Districts IX and XI.

It is interesting to note that this mileage of road-mixed surfacing constitutes only 17 percent of the total higher type of bituminous mileage constructed in 1951, while in the previous year the percentage was 28. This illustrates the growing trend toward the hot-mixed, hot-laid type of surfacing. Though initially more expensive, plant-mixed surfacing has a greater ability to withstand present-day traffic and climatic conditions, which is becoming more generally recognized.

The new specifications will provide a less restrictive type of plant-mixed surfacing which can be used instead of road-mixed surfacing to gain the advantages of a drier, to provide better asphalt control, and to permit the use of harder asphalts. It is anticipated that this type of surfacing will become increasingly popular due to its inherent advantages at a very little increased cost.

The 1951 record for riding qualities on road-mixed surfacing was made on Contract 51-9BC1-F, on Route 23 in Mono County. R. P. Shea was the contractor, and F. E. Thompson the resident engineer.

PORTLAND CEMENT CONCRETE PAVEMENT

County	Location	Contractor	Resident engineer	Street inspector	Average cubic yards placed per day	Roughness index inches/ mile	Remarks
Mendocino	City of Ukiah, Smith St. to Low Gap Rd.	O. C. Jones	H. W. Benedict	A. Wallace	121	13.1	Transit mix
Alameda	1½ mi. W. of Livermore and Hopyard Rd.	Fredrickson & Watson	J. F. O'Brien	A. A. Andrade	658	6.8	
San Francisco	Augusta St. to 25th St.	G. F. Atkinson & Chas. Harney	H. A. Simard	M. Hogan	369	8.6	
Monterey	Between Chular and Spence Underpass	Fredrickson & Watson	R. H. Roberts	W. H. Melcher, R. W. Gainer	661	5.6	
Kern	0.6 mi. S. of McKittrick Rd. to Haskins Rd.	N. M. Ball & Son	J. W. Cole	W. Adams	982	6.6	
Kern	Famosa Underpass to McFarland	Griffith Co.	P. A. Boulton	D. E. Peaslee	841	6.1	
Los Angeles-Kern	2.6 mi. S. of Rt. 59 and Fort Tejon	N. M. Ball & Son	W. M. Nett	D. D. Howell	1,043	6.6	
Madera	1.6 mi. N. of Madera to 0.3 mi. N.	G. F. Atkinson	T. E. Whaley	J. Walser	1,039	6.6	
Madera	0.6 mi. N. of Berenda to Califa	G. F. Atkinson	T. E. Whaley	J. Walser	806	6.6	
Tulare	1.0 mi. N. of Goshen and Traver	Griffith Co.	R. Windele	C. R. Blanthorn	779	6.3	
Los Angeles	Hollywood Freeway, Virgil Ave. to Glendale Blvd.	N. M. Ball & Son	H. E. Belford	R. De Laney	731	7.6	
Los Angeles	Hollywood Freeway, Western Ave. to Virgil Ave.	Griffith Co.	J. Ritter	A. N. George, R. Palmer	685	9.2	
Los Angeles	Hollywood Freeway, Glendale Blvd. to Grand Ave.	N. M. Ball & Son	H. Ayanian	J. Needham	472	9.2	
Los Angeles	Ramona Freeway, Evergreen Ave. to 0.2 mi. E. of Helen Dr.	J. E. Haddock, Ltd.	B. N. Frykland	E. L. Thompson	697	8.1	
Los Angeles	Rosemead Blvd., Garvey Ave. to Valley Blvd.	Vido Kovacevich	R. M. Cooley	J. H. Patterson	516	9.2	
Merced	Bet. Dutchman Creek and Lingard	G. F. Atkinson	W. F. Fleharty	A. E. Couto	1,080	5.9	
San Diego	Bet. the Willows and 4 mi. E.	Clyde N. Wood	L. G. Cline	N. Garlock	384	10.1	
				Average	686	*6.8	

* Weighted average.

ROAD-MIXED SURFACING

County	Limits	Contractor	Resident engineer	Roughness index inches/ per mile
Humboldt	Bet. 0.7 mi. E. of Fortuna City Limits and Hydesville	Mercer Fraser Co. and Mercer Fraser Gas Co.	F. Brann	31.0
Lake	Bet. 0.4 mi. and 0.7 mi. E. of Tulelake	M. W. Brown	P. A. Main	24.2
Mendocino	Bacon Gulch to ½ mi. N. of Signal Port Creek	A. B. Siri	R. B. Keehle	20.2
Mendocino	20 mi. S. of Fort Bragg at Salmon Creek	A. B. Siri	H. G. Fellman, A. J. Braga	20.2
Napa	Bet. 1.5 mi. S. and 4.6 mi. S. of Lake county line	C. Y. Syar	P. Karst	31.1
Riverside	Lakeview Ave., Nuevo to Lakeview	Foster & McHarg	P. E. Stout	20.3
Inyo	11 mi. N. of Trona and Death Valley Monument	Verne MacArthur	R. W. Fisher	19.5
Inyo	Bet. Division Creek and Aberdeen and bet. Keough Hot Springs and Stevens Corner	Verne MacArthur	R. E. Waters	18.2
Mono	Bet. 0.8 mi. N. of McGee Creek and 1.6 mi. N. of McGee Creek	Conrad Construction	C. H. Jackson	30.1
Mono	Bet. 5 mi. N. of Sonora Junction and Antelope Valley	R. P. Shea	F. E. Thompson	16.9
Kern	Bet. 1.7 and 7.2 mi. N. of Randsburg Junction	E. C. Young	G. J. Snyder	30.9
Imperial	Main St. bet. First St. and E. city limits of El Centro	Anderson Company	J. B. Howse	26.9
Riverside	Bet. Imperial county line and 3 mi. SE. of Mecca	Griffith	C. E. Walcott	17.9
Imperial	2 mi. NW. of Niland and Riverside county line	Hensler Construction	D. C. Smith	21.3
			Weighted average	21.2

PLANT-MIXED SURFACING

County	Limits	Contractor	Resident engineer	Tons per day	Roughness index inches/mile	Remarks
District I						
Del Norte	Smith River bridge to ¼ mi. N. Winton Cornera	Mercer Fraser Co.	R. C. Harkness	610	7.3	
Humboldt	Trinidad to 2.8 mi. northerly	Mercer Fraser Co.	E. J. Reed	340	8.1	
Mendocino	In City of Willits, S. city limits to N. city limits	Harms Bros. and C. M. Syar	A. Bragg and H. W. Benedict	390	16.4	
District II						
Modoc	Toms Creek to Cedarville	Rand Construction	H. H. Hoover	610	11.6	Continuous mixer
Shasta	Anderson to Redding	Frederickson and Watson	W. Z. Hegy	430	7.9	
Shasta	Hatchet Creek line change	Eaton and Smith	W. H. Bartlett	680	19.6	Continuous mixer
Siskiyou	Spring Hill to Weed	Rand Construction	E. Engle	770	12.7	
District III						
Butte	Bet. Oroville and Oroville-Quincy Highway at Ward Ave.	Rice Bros.	E. H. Wyman	470	12.3	
Colusa	6.8 mi. N. of Colusa to Glen County line	Harms Bros.	D. W. Klar	1,020	11.2	
Yolo	County road 29 to county road 27, about 6 mi. S. of Woodland	W. C. Railing	W. R. Green	640	11.9	Continuous mixer
Butte	0.7 mi. N. of Yuba County line to Union school	M. J. Ruddy & Son	M. Chapman	760	----------	
Colusa	Colusa to Meridian	Harms Bros.	W. J. Breaker	520	18.8	
El Dorado	Railroad crossing E. of Placerville to Five Mile Terrace W. of Camino	H. Earl Parker	E. F. Silva	430	9.7	
El Dorado	Railroad crossing near W. city limits to E. city limits in Placerville	Rice Bros.	E. F. Silva	710	11.9	
Glenn	1.1 mi. S. of Walker Creek to Walker Creek	C. V. Kenworthy	W. J. Breaker	300	16.0	2,000 lh. batch plant
Sutter	Meridian to 3 mi. W. Yuba City	Rice Bros.	M. Chapman	710	----------	Production records incomplete
Yolo	East St. in Woodland to Yolo Bypass	A. Teichert & Son	H. A. Towne	910	12.5	Continuous mixer
Yuba	Simmerly Slough to 0.4 mi. S. of Butte County line	Rice Bros.	M. Chapman	710	----------	
Alameda	Alvarado to 3 mi. southeaaterly (portions)	Clements & Co.	F. E. Thompaon	680	12.2	
Contra Costa	On Byron Rd., State Hwy., Rt. 76 and 1.6 mi. southeasterly of Byron	J. R. Armstrong	W. C. Dalton	600	12.1	
Contra Costa	On Marsh Creek Rd., 7.1 mi. E. of Clayton to 12.4 mi. W. of Byron	Louis Biasotti & Son	W. C. Dalton	280	----------	Slides on pavement
Napa	Imola Ave. W. bet. Napa State Hospital and 1.3 mi. W.	E. A. Forde	F. C. Smigle	620	12.2	
Alameda	Eastshore Hwy., Ashby Ave. to El Cerrito Overhead	Lee J. Immel	J. A. Whyte	640	9.8	
Contra Costa	Port Chicago Rd. to Pittsburg	Parrish Bros.	D. M. Young	680	16.2	Continuous mixer
Contra Costa	Herculea to Oleum	J. R. Armstrong	J. A. Whyte	360	13.8	
Contra Costa	Monument to Concord (portions)	J. R. Armstrong	G. E. Beckwith	710	----------	
Contra Costa	Luzon Underpass to Christie Underpass	Lee J. Immel	D. M. Young	730	----------	
San Mateo	1 mi. S. of Lobitas to ½ mi. N. of Lobitas	Westbrook & Pope	W. G. Remington	460	9.9	
San Mateo	Bayshore Hwy., S. city limits of San Francisco to N. city limits of So. San Francisco	Charles L. Harney	G. W. Levier	630	18.6	
Santa Clara	Bet. Palo Alto and Sunnyvale	Frank B. Marks	L. A. Marks	470	13.0	
Santa Clara	Cape Horn to Merced County line	Eaton & Smith	G. W. Levier	660	----------	Fill settlement
Santa Cruz	At Respini Creek bet. 2.3 mi. and 1.6 mi. S. of Davenport	Elmer J. Warner	W. G. Remington	480	9.4	
Sonoma	Bet. Cloverdale and Healdsburg (various locations)	J. R. Armstrong	G. Dillon	490	13.0	
Sonoma	Various locations bet. Healdsburg and Santa Rosa and at Sonoma	A. G. Raisch	G. Dillon	490	8.4	
Sonoma	Bet. Petaluma Creek and Tolay Creek	Piombo Const.	W. Travis	470	13.6	
District V						
Monterey	Mosa Landing to 2 mi. S. of Watsonville Airport	Leo Piazza	H. J. Holman	740	14.2	
San Benito	Chittenden Rd. to 1 mi. N. of San Benito River	Granite	H. J. Doggart	620	8.6	
San Benito	Holliater to Santa Clara County line	Fredrickaon & Watson	C. F. Roderick	790	8.0	
San Luis Obiapo	Atascadero to 1 mi. S. of Templeton	M. J. B. Const.	V. E. Pearson	640	8.6	
San Luis Obispo	San Luis Obispo County, Rt. 33 and Kern County line (portions)	Granite	W. J. Paivine	500	14.8	
Santa Barbara	In city of Santa Barbara, Salsipuedes St. and bet. Bath St. and Junipero St.	N. M. Ball Sons	T. L. Miller	310	16.6	2,000 lb. batch plant
Santa Barbara	Bet. 0.6 mi. N. of Las Cruces and 1 mi. N. of Summit	Granite	A. P. Campbell, A. L. Lamb	736	11.1	
Santa Barbara	San Julian Ranch to 1.8 mi. N. of Ytias Creek	Valley Paving & Constraction	T. L. Miller	420	11.0	
Santa Barbara	Tequepis Canyon to 1½ mi. E. of Santa Ynez River Bridge	Kirat & Sons	A. L. Lamb	840	11.6	4,000 lb. batch plant
Santa Barbara	Hot Springs Canyon to Tequepis Canyon	J. A. Payton	A. L. Lamb	760	11.4	4,000 lb. batch plant
District VI						
Fresno	Shaw Ave., State Hwy. to Fruit Ave.	Gene Richarda	P. A. Rockas	600	18.2	
Fresno	On Manning Ave., Zediker Ave. to Kings River Bridge	Baun Constraction	H. R. Longworthy	626	16.0	
Kern	Weed Patch-Wheeler Ridge Rd., Davis Rd. to Wheeler Bridge	Oilfields Trucking & Phoenix Const.	W. M. Nett	1,090	12.3	
Kings	10th Ave., Seventh St. and Grangeville and Layton Hwy. Last Chance Ditch to Kings River	Baun Const.	C. J. McKee	860	22.8	
Tulare	Lovers Lane, FAS 1143 and State Rt. 10 and Ben Maddox Way, bet. State Rt. 10 and State Rt. 133	Rice Bros.	W. C. Clark	810	11.6	4,000 lb. batch plant
Tulare	Bet. E. city limits of Dinuba and Orosi	Oilfields Trucking & Phoenix Const.	W. C. Clark	820	----------	
Kern	Junction Rt. 136 to the Tulare County line	Griffith Company	P. A. Boulton	710	7.6	Production records incomplete
Kern	Famosa Underpass to McFarland	Griffith Company	P. A. Boulton	710	7.6	
Kern	4.4 mi. E. Sivert to 2 mi. W. of Bear Mountain ranch	Oilfields Trucking & Phoenix Const.	W. M. Nett	630	16.8	

PLANT-MIXED SURFACING—Continued

County	Limits	Contractor	Resident engineer	Tons per day	Roughness index inches/mile	Remarks
District VI—Continued						
Los Angeles-Kern	2.5 mi. S. of Rt. 59 to Fort Tejon	N. M. Ball Sons	W. M. Nett	1,140	11.4	
Madera	Cottonwood Creek to N. city limits of Madera	P. J. Moore	T. E. Whaley	710	16.0	
Madera	1.5 mi. N. of Madera to 0.3 mi. N. of Dry Creek	Guy F. Atkinson	T. E. Whaley	750	15.0	
Madera	0.5 mi. N. of Berenda to Califa	Guy F. Atkinson	T. E. Whaley	750	7.4	
District VII						
Los Angeles	1.5 mi. W. of Calahasas to 1.6 mi. E. of Malibu Junction	Basich Bros.	L. E. Steele	1,090	12.2	Continuous mixer
Los Angeles	Hollywood Parkway, Hill St. to Spring St.	Guy F. Atkinson	R. A. Collins	290	19.2	Asphalt concrete
Los Angeles	Front St. and Providencia Ave. 200 ft. westerly Olive Ave. to San Fernando Blvd.	Jesse Smith	L. W. Sixt	670	18.3	Asphalt concrete
Los Angeles	0.4 mi. S. of Castaic Creek to 0.4 mi. N. of Palomas Wash	Lefever, Bing, Basich Bros.	R. E. Deffehach, F. E. Sturgeon	1,480	9.0	Continuous mixer
Los Angeles	Mint Canyon Highway, 0.5 mi. S. of S. P. Railroad overhead and Sodamint	Basich Bros.	R. E. DeLaney	700	11.1	
Los Angeles	Sierra Highway, Tunnel Station to northerly end of Sec. H	Basich Bros.	R. E. DeLaney	1,090	14.6	
Los Angeles	Pacific Coast Hwy. at Sunset Blvd. and Chautauqua Blvd.	Jesse Smith	H. F. Meinke	310	17.0	
Los Angeles	Lincoln Blvd. S. city limits of L. A. to Washington Blvd.	Oswald Bros.	D. J. Faulkner	610	17.8	
Los Angeles	Pacific Coast Hwy., Vermont Ave. to Figueroa	Warren Southwest	C. C. French	500	12.8	
Los Angeles	Palisades Beach road westerly Tunnel Portal at Colorado Ave:	Schroeder and Company	H. F. Meinke	940	13.1	
Los Angeles	Centinela Ave., Freeman Blvd. to Sepulveda	Oswald Bros.	D. J. Faulkner	710	15.7	
Los Angeles	Lakewood Blvd., Carson St. to Center St.	W. S. Mecham	L. W. Sixt	770	9.2	
Los Angeles	Rosemead Blvd., Garvey Ave. to Valley Blvd.	Vido Kovacevich	R. M. Cooley	730	10.4	
Los Angeles, Ventura	Bet. 2 mi. E. of LA-Ventura County line to 1 mi. W. Moorpark Road	Fredericksen & Kasler	M. F. Mastera	860	9.3	4,000 lh. batch plant
Orange	Sea Scout Base to S. city limits of Newport Beach	Cox Bros.	D. J. Faulkner	580	13.4	
Orange	Santa Ana Freeway, Los Angeles County line to 0.2 mi. SE of Euclid Ave.	Sully-Miller	B. N. Frykland	760	16.2	Asphalt concrete
Orange	Santa Ana Freeway, 0.2 mi. SE. of Euclid Ave. to State Rt. 2 at Miraflores	Griffith Company	C. E. Dresser	450	13.5	4,000 lb. batch plant
Orange	Garden Grove Blvd., Stanton Ave. to the Pacific Electric RR in Garden Grove	Roland T. Reynolds	J. L. Needlam	720	15.1	Portions under water
Ventura	State Rt. 2 to the Santa Clara River	Conrad Const.	M. F. Masters	530	11.9	
District VIII						
San Bernardino	Central Ave., Foothill Blvd. to Phillips Blvd.	Hess Construction	P. E. McKean	880	13.8	
Orange-Riverside	Bet. 1.7 mi. W. of Orange County line to Corona	Peter Kiewit Sons	W. H. Crawford	1,120	10.1	Continuous mixer
Riverside	Southern Pacific RR to Sedgwick Ave. in City of Riveraide	R. A. Erwin	J. B. MacDonald	460	11.1	
Riverside	In Corona, W. city limits to E. city limits	E. L. Yeager	L. M. Barnett	640	12.3	
Riverside	W. of Hemet and Sanderson Ave.	R. A. Erwin	Paul Wittig	500	7.4	
Riverside-San Bernardino	2.3 mi. E. of Redlands and Beaumont	Fredericksen and Kasler	E. A. Bannister	1,010	11.2	6,000 lb. batch plant
San Bernardino	Bet. State Rt. 25 to Grant Ave.	Hubbs Equipment	J. H. Chaudom	490	17.1	
San Bernardino	On Main St., through Barstow and Main St. to N. junction with Rt. 58	Peter Kiewit Sons	R. E. Small	670	8.3	Continuous mixer
San Bernardino	1.3 mi. W. of Running Springs and Running Springs	Hess Construction	M. E. Nelson, R. H. Ramey	630	13.7	Portions covered hy anow
District IX						
Inyo	Bet. Rt. 63 and 1.3 mi. N. and bet. W. city limits and Main St. in Bishop	G. W. Ellis	W. R. Coons	315	9.9	
District X						
San Joaquin	Bet. State Highway Rt. 4 and Jacktone Road at Collegeville	M. J. B. Construction	C. A. Plecarpo	690	8.5	
Stanislaus	On McHenry Ave., State Highway Rt. 13 to San Joaquin County line	M. J. Ruddy & Son	C. D. Hof	400	18.1	2,000 lb. batch plant
Stanislaus	Bet. City of Oakdale and town of Waterford	United Concrete Pipe	C. D. Hof	340	12.3	
Stanislaus	On Oakdale-Valley Home Road, State Hwy. Rt. 55 to Valley Home	United Concrete Pipe	C. D. Hof	570	8.9	
Stanislaus	Bet. Turlock and Crowa Landing Road and bet. Monte Vista Ave. and Turlock	United Concrete Pipe	C. D. Hof	910	11.1	
Stanislaus	Bet. Modesto and 5.4 mi. W.	United Concrete Pipe	C. D. Hof	600	9.4	
Calaveras	Bet. Murphy's and Big Treea	M. J. Ruddy & Son	K. N. Hatch	520	15.0	
Mariposa	Bet. Cathay junction and 5 mi. E.	Munn & Perkins	J. H. Kurata	560		
Merced	Bet. Dutchman Creek and Lingard	Guy F. Atkinson	W. F. Fleharty	670	10.9	
Merced	Bet. Santa Clara County line to 3.5 mi. E.	Munn & Perkins	H. R. Jantzen	580	12.5	
Stanislaus	Portiona bet. 10.5 and 5.0 mi. W. of Modesto	M. J. Ruddy & Son	H. C. Landon	480	11.5	
Tuolumne	Bet. Montezuma Road to 1 mi. S. of Jamestown	Geo. F. France	F. L. Lucas	450	11.2	
District XI						
San Diego	Bet. Cabrillo Freeway in the City of San Diego and Fairmont	Griffith	F. D. Pearce	880	14.0	
Riverside	Indio to Black Butte	J. L. Miller & Son	W. R. Connelly	600	9.4	
San Diego	Bet. H St. in Chula Vista and 4th St. in National City	MacClosky & Hazard	W. T. Rhodes	920	16.1	4,500 lb. batch plant
San Diego	Balboa Ave. in City of San Diego and Las Flores	Griffith	A. C. Estep	950	13.8	4,000 lb. batch plant
San Diego	Chambera St. in El Cajon and Second St.	R. E. Hazard	Don C. Smith	910	15.0	
					11.4	Weighted average

Wanted . . . Engineers

By G. F. WINSLOW
Associate Highway Engineer

Wanted—Engineers.

Thirty thousand graduate engineers are wanted in the United States each year, a number almost as great as the population of Reno, the biggest little city in the world. Thirty thousand, besides the engineering aids and technicians who never completed a college course.

What is an engineer? Instead of using the dictionary, I would rather quote the late C. S. Pope, who was Construction Engineer with the California State Highway Department: "Engineers are and should be eminently practical men, and men who are not only necessary, but who should be sought in every public undertaking of a constructive nature."

F. C. Wright in a technical paper used different words to say the same thing: "Engineering is the directing of the powers of nature to the use of man. An engineer is one who can do for one dollar what any fool can do for two. We think of Civil Engineers as men who come in daily contact with three things: (1) natural forces, (2) men, and (3) money. To coordinate those three so that they jointly can do the best work, is the real job of the engineer."

What Makes an Engineer

But the masterpiece was written about 150 years B.C. by Marcus Vitruvius:

> "He should be a good writer, a skillful draughtsman, versed in geometry, and optics, expert at figures, acquainted with history, informed on the principles of natural and moral philosophy, somewhat of a musician, not ignorant of the sciences, both law and physics, nor of the motions, laws and relations to each other of the heavenly bodies."

But why the cry for engineers, a group of which there were only about 25,000 in the United States 60 years ago? At the turn of the century there were less than 40,000; by 1940 they had increased to about 250,000; while today there are about 400,000 engineers, the third largest profession, exceeded only by the teaching and nursing professions. The statistics are funny. In 1946, a year when there were 12,000 engineering graduates, a survey indicated that 25,000 graduates per year would satisfy the demand by 1952. In 1950 alone there were 52,000 graduates, and now there is still a deficiency of 60,000. Keeping in mind that 30,000 graduate engineers are needed each year, the estimated prospects are 26,000 in 1952, 20,000 in 1953, and 12,000 to 17,000 for 1954.

Engineer Shortage

Now the estimate is that the supply will not meet the demand until 1965. In other words, the present third grader in primary school might have some competition in the engineering field when he graduates from college. One writer explains the shortage by these reasons:

1. The GI Bill sent unpredicted numbers to college.
2. Industrial demands increased.
3. Korea demands caused precipitous drop in students.

When the large increase in students was noted, schools and vocational advisors warned against impending surplus of engineers and danger of unemployment.

The present-day engineering graduate does not have to consider unemployment but rather which of the many offers is the best. A graduate of Columbia University had offers from Colgate-Palmolive-Peet Company, U. S. Steel, Westinghouse, Hughes Tool Company, Otis Elevator, Chase Brass & Copper, Continental Can, Eastman Kodak, Union Carbide & Carbon, Electro Metallurgical Company, Brown Instrument Company, Procter & Gamble, Ford, General Electric, and du Pont Company.

Plenty of Jobs

One company tried to employ the entire graduating class of Southern Methodist University. Three hundred twenty graduates of Case Institute of Technology had a total of about 1,400 offers. General Electric, with a starting salary of $325 a month, expects to fill only 500 out of 1,500 openings. One company sent out 22 engineers to interview graduates. They not only failed to obtain recruits, but lost one of their own engineers in trying.

The California State Personnel Board, in obtaining junior civil engineers for the Highway Department, contacted schools across the Nation early last year. It found about 2,640 interested enough to take the examination, and obtained a list of 1,300 eligibles, of which 675 were appointed, the remainder presumably taking employment elsewhere. This year only about 1,080 were interested.

Junior Civil Engineer

California sets up the following in its announcement:

"*Facts About the Position:*

"Under supervision, a Junior Civil Engineer assists in engineering work related to land, hydraulics, roads, bridges, wharves, piers, dams, levees, and similar works; acts as instrument man on a surveying party; keeps survey and construction notes; makes engineering calculations; does simple design work and drafting work; makes maps, charts, and diagrams; acts as inspector on highway construction and structural steel, concrete and timber construction; makes tests, or takes samples for laboratory analysis on materials being used for construction projects; makes field inspections of existing structures to determine deterioration or defects; assists in the preparation of construction reports and estimates; and does other work as required.

"*Scope of the Examination:*

1. Knowledge of the basic principles of physics, chemistry, and mathematics as applied to civil engineering.
2. Knowledge of surveying.
3. Knowledge of hydraulics.
4. Knowledge of stress analysis and mechanics.
5. Knowledge of the strength, properties, and uses of engineering construction materials.
6. Familiarity with the methods and equipment of engineering construction.
7. Familiarity with engineering economics and with the common descriptions of real property.

"All candidates must possess the personal qualifications generally recognized as essential in good public employees including integrity, initiative, dependability, courtesy,

good judgment, and ability to work cooperatively with others."

Paul Cohen in an article on "The Shortage of Engineers" stated: "Of the various shortages currently facing the American economy, none is potentially more serious than the scarcity of engineers."

Raymond Archibald at the Western Association of State Highway Officials said: "You do not need to be told there is a shortage of engineering manpower because you are faced with that situation today, but the real problem is ahead of us because prospects of relieving that shortage in the future are on the minus side. Graduate engineering students will not fill the demand and the number graduating is on the decline. Conservative estimates indicate that in three or four years the colleges will be sending us only one-third of the highway engineers actually needed. We will have to do with fewer engineers what we are committed to do, and find means of doing it."

A national program by the U. S. Labor Department and engineering groups for alleviating the shortage of engineers includes:

1. Making maximum use of engineers already employed.
2. Making better use of supporting nonengineering personnel.
3. Making more exhaustive use of training facilities.

While aerial surveying and radio communication cut down the ground work for the field and improved equipment aids the office force, the demand for trained engineers is still increasing. If you have a son or friend in high school or entering college, tell him of the shortage of engineers.

COMMISSIONER BAKER BUSY MAN

Highway Commissioner Harrison R. Baker of Pasadena has reluctantly refused reappointment to the city planning commission of his home city because of the pressure of state business.

Mr. Baker was senior member of the planning commission, having served on it continuously since June 27, 1929. He was first appointed to the California Highway Commission by Governor Warren in 1943. He advised Mayor Alson E. Abernethy of Pasadena that increasing work on highway matters made it necessary for him to resign from the planning commission.

AN UNUSUAL PILE-DRIVING PROJECT



On the Ramona Freeway in Los Angeles, approximately 22,000 lineal feet of piles are being driven under conditions such as depicted in the above photograph. As the photograph shows, both batter and plumb piles are being driven and the one pile-driving rig is doing the entire job. The weight of this piece of equipment with all attachments is over 100 tons.

The work is being done by the Raymond Concrete Pile Company for the contractor, Griffith Company of Los Angeles, under plans and specifications prepared by the State Division of Highways.

RUSH-HOUR DRIVING

Little time is saved by weaving from lane to lane and trying to hurry through rush-hour traffic on streets and highways. Your chances of an accident are much less if you stay in your own lane, and you'll get to your destination in just as good time.

Freeway Between Grass Valley and Nevada City Planned

Construction of a four-lane divided freeway between Grass Valley and Nevada City has been brought a step nearer as a result of route adoptions by the California Highway Commission.

The actions were taken following receipt of resolutions from the city councils of Nevada City and Grass Valley, and from the Nevada County Board of Supervisors, all stating that a hearing by the Highway Commission was not considered necessary before final decision by the commission.

Altogether nearly eight miles of relocation of existing routes are involved. The recommendations of the Division of Highways, as adopted by the commission, were based on an origin and destination survey of the traffic and also on studies made with the assistance of local authorities and civic groups to determine the best location considering present and anticipated future needs of through and local traffic.

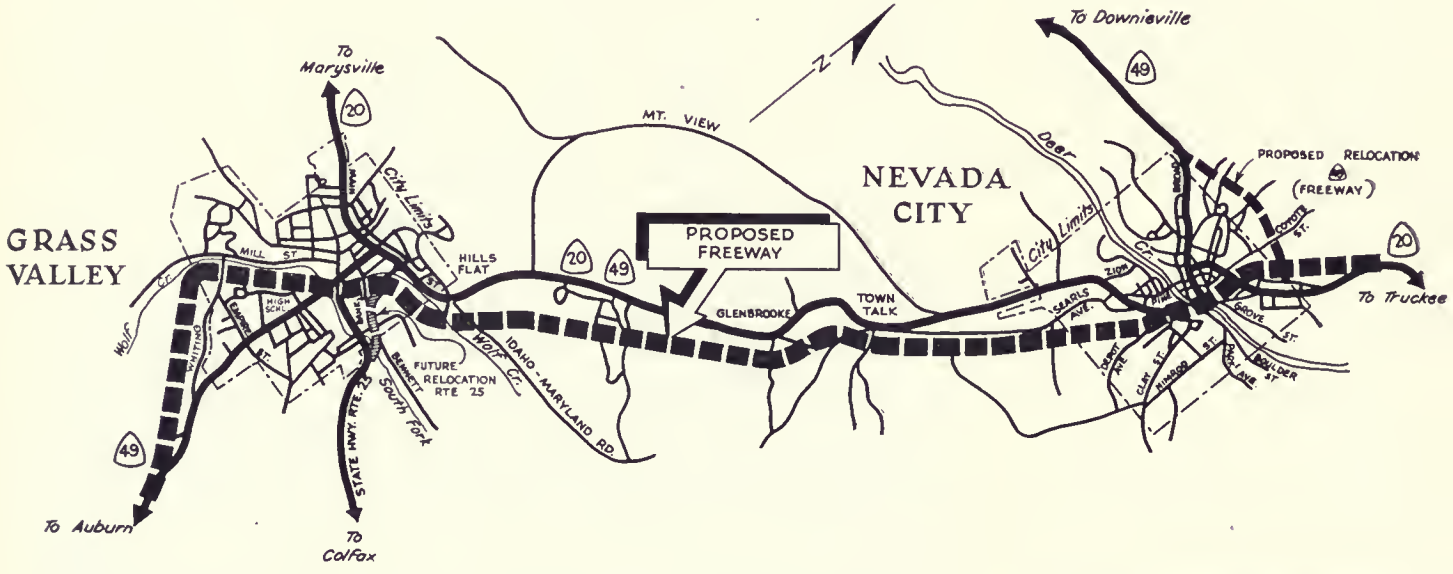
One of the important features of the proposed plan is the removal of Sign Route 49 from Broad Street in Nevada City. Most of the streets in the historic mining centers of Grass Valley and Nevada City are unsuited to large volumes of through traffic, with the complication of a high percentage of large trucks. Broad Street in Nevada City presents a particular problem in this respect because of its steepness. The people of Nevada City and the state engineers are particularly desirous of accomplishing relocation of this portion of Sign Route 49.

Several highway grade separations and other structures are included in the proposed design for the new freeway.

The joint section of Sign Routes 20 and 49 serves both the important north-south Mother Lode Highway and the east-west Tahoe-Ukiah lateral, as well as the fast growing local traffic.

Rolling grades, curving alignment, narrow width and roadside development made the present highway between Grass Valley and Nevada City congested and inadequate.

Funds are not immediately available for construction. Several years will be required for rights of way purchase alone and decision will then have to be reached as to which portion of the relocations will be constructed first.



The routings adopted and declared freeways are as follows:

On State Sign Route 49, from three-fourths of a mile south of Grass Valley to Sign Route 20 in Grass Valley; thence along a new joint routing of Sign Routes 20 and 49 to the east city limits of Nevada City. At that point, the relocation of Sign Route 20 continues northeasterly for one-half mile to a junction with the existing route leading toward U. S. 40 by way of Bear Valley. The proposed relocation of Sign Route 49 toward Downieville from the new junction of Sign Route 20 at the north city limits of Nevada City is nearly a mile in length, rejoining existing Sign Route 49 near the northwest corner of the city limits of Nevada City.

MAGAZINE INFORMATION

EDWARD R. BACON COMPANY
San Francisca 10, Califarnia

Mr. Kenneth C. Adams, *Editor*

Dear Mr. Adams: Over a period of many years which we have been receiving this magazine we believe it to be the most outstanding magazine of its kind. We have a complete file since 1935 and many times they are referred to for information.

Thanking you for renewing our listing.

Yours very truly,
Edward R. Bacon Company,
H. J. Learn, Manager,
Fresno Branch

State Employees Save Taxpayers Money With Ideas

CALIFORNIA taxpayers were saved $81,130 in the first eight months of 1952 through the Employee Suggestion Plan that resulted in significant departmental savings and increased efficiency.

The State's Merit Award Board, in recognizing alert and conscientious employees who submit money-saving ideas, announce that more than 100 state civil service employees had their suggestions adopted so far this year. Of these, 62 were cash winners, ranging from $5 to $500.

State departments which benefited from monetary savings awarded a total of $2,525 to employees on recommendation of the Merit Award Board which surveys submitted ideas and investigates their practicability.

Actual cost to the State in awarding cash was slightly more than 2 cents of every dollar saved as a result of adopting the ideas.

INFORMATION SOURCE

COUNTY OF LOS ANGELES
Road Department

DEAR SIRS: I am presently employed by the Los Angeles County Road Department as a civil engineer assistant in the Location and Design Section of the Construction Division.

I've recently had the pleasure of seeing a copy of your publication, *California Highways and Public Works*, and was very greatly enthused by the wealth of valuable information it contains.

I would appreciate it if you would consider me for your mailing list because I'm sure that I will find your magazine very instructive and applicable to a great deal of my work. It is certainly one of the finest sources of information that I've seen in the field of highway and road design.

Very sincerely,

J. RAMIREZ

LITTLE JUNIOR DOES BIG JOB

By W. D. SEDGWICK, Assistant District Engineer



THE LARGE highway vacuum cleaner now operating in District VII has recently been receiving considerable publicity, but now we want to introduce "Junior," a small-size vacuum cleaner and sweeper which is also doing a fine job. We have a 48-inch Wilshire power sweeper which is so small that it can easily be transported between jobs on a tilt-trailer that can be towed behind a three-quarter-ton pickup truck.

Junior is used to clean the gutters in the small cities and towns like Hueneme, Camarillo, Somis and Ojai. It is also used to advantage in sweeping the railroad underpasses and cleaning up around curb returns at channelized intersections where there are always unsightly accumulations.

Junior does much that did not get done at all before we had it. It is efficient and economical in operation. It replaces four men with brooms, thus making them available for other much needed maintenance work that could not otherwise be accomplished due to limited maintenance funds which keep allowable manpower to a minimum.

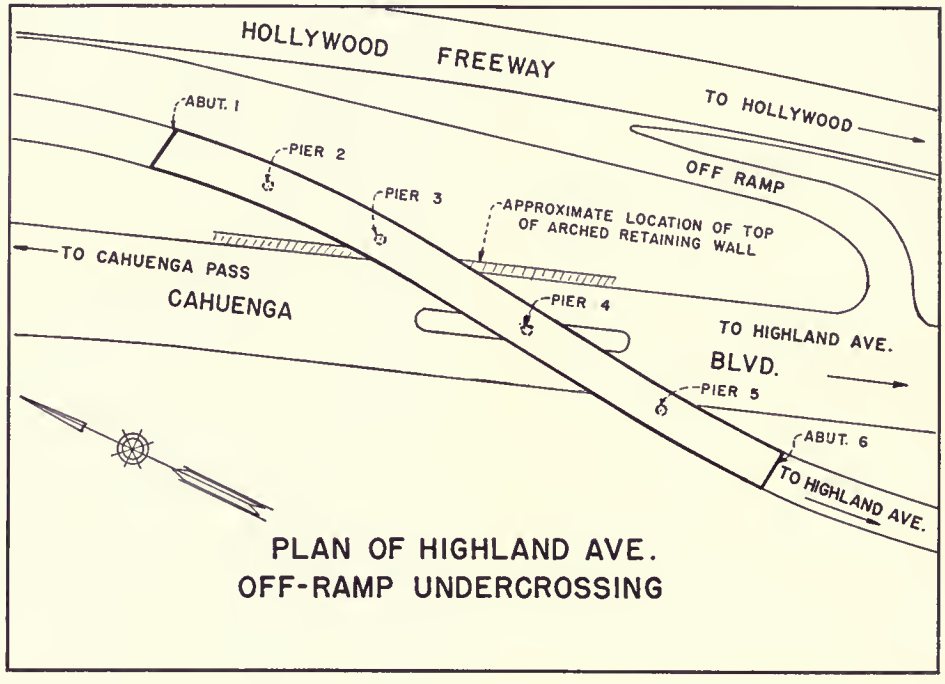
Unusual Problem

Bridge Footings Are Revised To Clear Obstruction

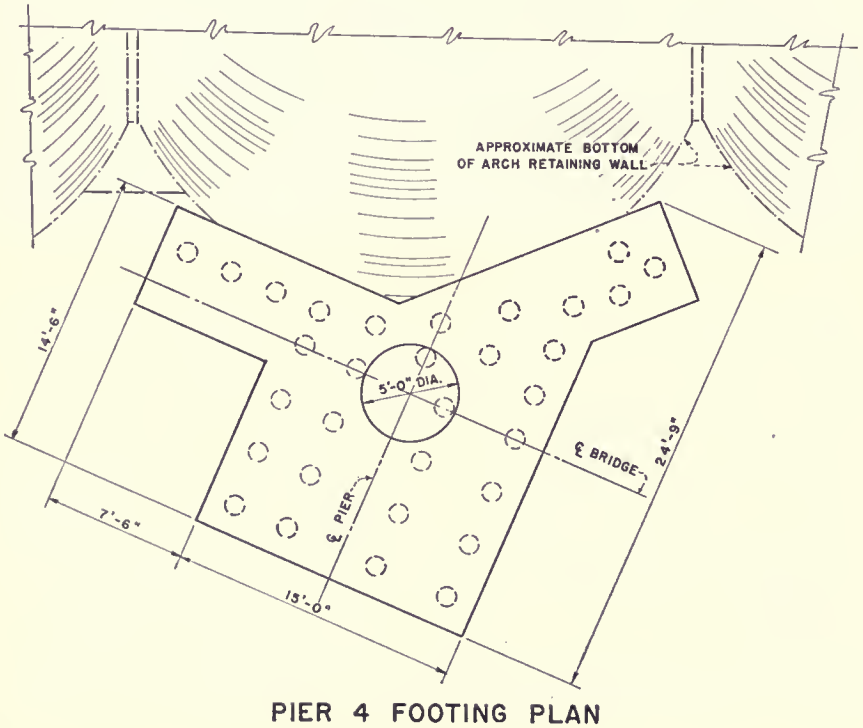
By JASON PLOWE, Senior Bridge Engineer

When excavation for footings of the Highland Avenue Off-ramp Undercrossing on Hollywood Freeway was started an unexpected and unique obstruction was encountered. This proved to be a long buried concrete arch and buttress-type retaining wall. As this wall interfered with pier footings 3 and 4 of the new bridge, exploration of the area by means of drilling was necessary to determine the exact location of the old wall with respect to the footings of the bridge.

With work already started a speedy determination of the extent and location of the old wall was required. Two drilling crews were immediately sent to the site and put down 17 holes aggregating over 700 feet. With the information secured from this drilling, revised footing details for two piers which the original plans placed over the wall, could be made. To save time the revised footing plans were prepared on the job by the writer.



PLAN OF HIGHLAND AVE. OFF-RAMP UNDERCROSSING



PIER 4 FOOTING PLAN

Change in Design

As originally planned the bridge was of the continuous concrete box girder type. The piers were single circular columns; Pier 3 was to be supported on concrete piles and Pier 4 on a spread footing. The buried wall was found to be 50 feet high with 30-foot barrel arch spans.

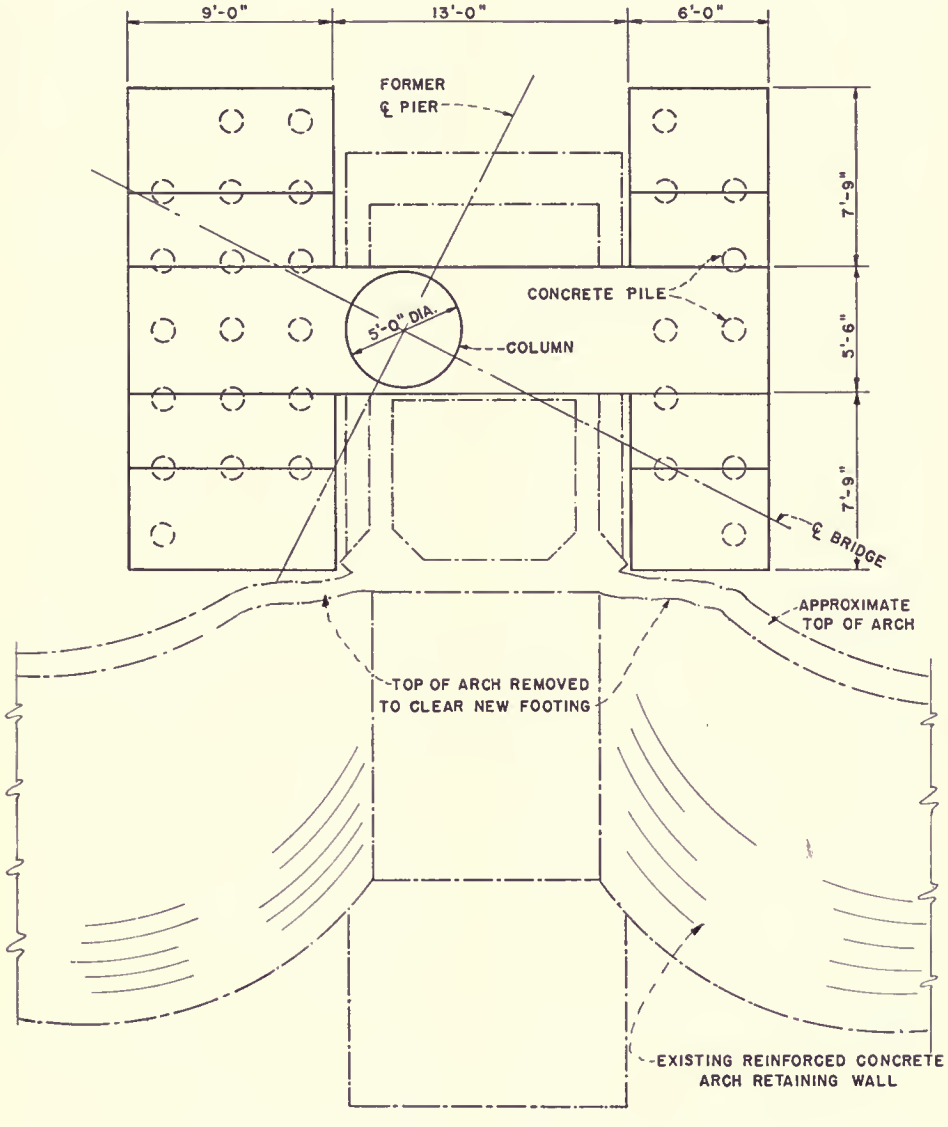
In the revised scheme at Pier 3, the column was supported upon a reinforced concrete beam which straddled the old wall. This beam in turn rested upon concrete pile footings which were clear of the wall; the whole being H-shaped in plan.

Pier 4 of the new structure was located with its footing center a few feet from the rear face of the old retaining

wall arch and about midway between buttresses. For the revised footing concrete piles were grouped around the contour of the obstructing arch. This retained a fairly simple pile-driving layout in an obstruction-free area. The new concrete footing was heavy slab construction roughly Y-shaped in plan as required by the relocated piles.

Thus, a blanket of earth and paving materials covers another evidence of a struggle with the difficulties and problems encountered in building bridge substructures below the ground level. The trim and finished lines of the bridge columns and girders tell little of the efforts necessary to properly support them. Foundations may sometimes appear as ugly ducklings better to be covered up with a mantle of earth but this does not belie the fact that without proper bridge foundations the sturdiest bridge superstructure will have little value.

Drilling crews operated under the supervision of T. L. Sommers, Associate Engineer Geologist; C. J. Verner was Resident Engineer on bridge construction and Bongiovanni Construction Company, general contractor.



PIER 3 FOOTING PLAN

Shasta Lake

Continued from page 49 . . .

half the Kamloops were put in the lake. The other half of the trout were kept as brood stock.

This was three years ago. Since then other plantings have been made and are continuing. The first trout put in the lake had some fins clipped so they could be later identified. Some have been caught up to 28 inches in length and to a weight of eight pounds. From here on they will grow faster.

How about the native rainbow? They are doing well, thank you, and if they were not overshadowed by the bass and Kamloops they would really be getting attention in their own right.

Kamloops Incorporated

This year Kamloops Incorporated held its first annual convention. The members met on an area leased from the Forest Service on the McCloud arm of Shasta Lake. It was an overnight affair. In fact, most everyone came Friday and went home Sunday. Over 200 members brought their sleeping bags and bedded down under the stars. Governor Warren was among the notables who attended. They all reported a wonderful time. The success of this year's meeting undoubtedly means a still larger attendance next year.

What effect has this had on highway travel? There were 222,780 registrants at the Vista House at Shasta Dam last year. By August 1st of this year, 157,515 had registered; 40,770 of these came in the month of July. Many others did not register.

Just why is all this so important to the Division of Highways? Every one of these visitors to the Vista House at the dam and all these fishermen come in and depart over U. S. 99. By all indications there will be a heavy increase in the number of sportsmen. Visitors may see Shasta Dam once and be satisfied, but a person who has a successful fishing trip is only satisfied if he can come again.

HIGHWAY BIDS AND AWARDS

July, 1952—Continued

ALAMEDA COUNTY—Between 2.3 miles east of Redmond Overhead and Greenville, about 6.7 miles to be surfaced with plant-mixed surfacing on cement treated base material and portions to be reconstructed. District IV, Route 5, Section E. Clements & Co., Hayward, $260,389; M. J. B. Construction Co., Stockton, $292,226; Fredrickson & Watson Construction Co., Oakland, $295,744; Harms Bros., Sacramento, $295,817. Contract awarded to Lee J. Immel, San Pablo, $249,921.50.

ALAMEDA COUNTY—In the City of San Leandro, between north city limits and San Leandro Creek, about 0.7 mile, the outer lanes to be reconstructed with plant-mixed surfacing on cemeot treated base. District IV, Route 105. Lee Construction Co., San Leandro, $79,996; Lee J. Immel, San Pablo, $81,073; J. Henry Harris, Berkeley, $81,155. Contract awarded to Independent Construction Co., Oakland, $75,077.50.

DEL NORTE COUNTY—At Crescent City maintenance station, superintendents office building to be constructed. District I, Route 1, Section C. Osborne-Wheelon Construction Co., Crescent City, $6,595. Contract awarded to A. R. Ogburn, Crescent City, $6,200.

FRESNO COUNTY—At Whites Bridge, across Kings Slough, about 2.7 miles south of Mendota, a reinforced concrete bridge and approaches surfaced with plant-mixed surfacing to be constructed. District VI, Route 41, Section P. Thomas Construction Co., Fresno, $115,476; E. G. Perham, Los Angeles, $127,806; George Pollock Co., Sacramento, $129,-373; C. B. Tuttle, Long Beach, $133,485; Tumblin Co., Bakersfield, $141,846. Contract awarded to Bann Construction Co., Fresno, $108,551.

HUMBOLDT COUNTY—At Shively Bluffs, about 0.2 mile to be graded and surfaced with plant-mixed surfacing on cement treated base and slope protection to be constructed. District I, Route 1, Section D. Fredrickson Bros., Emeryville, $196,-043; Eaton & Smith, San Francisco, $208,888; J. Henry Harris, Berkeley, $216,762. Contract awarded to Humboldt Constructors, Inc., Eureka, $182,203.

HUMBOLDT COUNTY — Between Gannon Slough and 0.9 mile north of Plaza Avenue, about 2.9 miles to be graded and portions to be surfaced with plant-mixed surfacing on imported base material or cement treated base. District I, Route 1, Sections H, Arc., I. Ball & Simpson, Berkeley, $671,-065; Guy F. Atkinson Company, South San Francisco, $694,099; Ukropina, Polich & Kral, San Gabriel, $784,609. Contract awarded to Mercer, Fraser Company & Mercer, Fraser Gas Co., Inc., Eureka, $629,293.70.

KERN COUNTY—Between east city limits of Bakersfield and 1.4 miles east of Route 143, about 4.9 miles to be surfaced with plant-mixed surfacing and corrugated metal pipe culvert to be installed. District VI, Route 58, Section C. Dicco, Inc., Bakersfield, $74,917. Contract awarded to Griffith Company, Los Angeles, $66,761.

LAKE COUNTY—At Dry Creek and Dry Creek Overflow, about ½ mile west of the junction of routes 89 and 49 in Middletown, two reinforced concrete bridges to be constructed and about 0.3 mile of approaches thereto to be graded and surfaced with road-mixed surfacing on cement treated imported base material and a seal coat to be applied thereto. District I, Route 89, Section B. Arthur B. Siri, Inc., Santa Rosa, $89,242; Lefever & Bing, West Sacramento, $91,399; Al Erickson & Co., Napa, $96,835; O'Connor Bros., Red Bluff, $97,003; J. Henry Harris, Berkeley, $97,777. Contract awarded to Harold Smith, St. Helena, $81,284.50.

LOS ANGELES COUNTY—On Harbor Freeway, at 11th and 12th Streets in the City of Los Angeles, two reinforced concrete box girder bridges to be constructed and city streets to be graded and paved. District VII, Route 165. J. E. Haddock, Ltd., Pasadena, $369,934; George W. Peterson, Jack W. Baker, Los Angeles, $372,658; Oberg & Cook, Gardena, $373,695; W. J. Disteli, Los Angeles, $382,-464; Ukropina, Polich & Kral, Baldwin Park, $393,-011; Charles MacClosky Co., San Francisco, $396,890; Byerts & Sons & Geo. K. Thatcher, Los Angeles, $419,910; FEPCO, Los Angeles, $484,026. Contract awarded to Obert Bros. Construction Co., Inglewood, $352,246.

LOS ANGELES COUNTY—On Santa Ana Freeway between Orr and Day Road and Pioneer Boulevard, about one mile to be graded and surfaced with Portland cement concrete pavement on cement treated subgrade; interchange roadways, acceleration and deceleration lanes to be surfaced with plant-mixed surfacing on untreated rock base; and a bridge over the Southern Pacific Railroad tracks to be constructed, to provide a freeway with a four-lane divided roadway. District VII, Route 166, Section A. J. E. Haddock, Ltd., Pasadena, $731,832; Griffith Company, Los Angeles, $785,610; A. Teichert & Son, Inc., Sacramento, $802,595; J. A. Thompson & Son, Contractors, Inglewood, $832,485; Webb & White, Los Angeles, $887,722. Contract awarded to Ukropina, Polich & Kral, San Gabriel, $694,419.50.

LOS ANGELES COUNTY—Between Washington Boulevard and Flory Drive, about 0.5 mile to be widened and paved with asphalt concrete. District VII, Route 170, Section A. Vido Kovacevich Co., South Gate, $128,501. Contract awarded to J. E. Haddock, Ltd., Pasadena, $118,290.

LOS ANGELES COUNTY—On Artesia Street between Long Beach Boulevard and east city limits of Long Beach (Downey Avenue), about 2.4 miles, a graded roadbed to be constructed and surfaced with asphalt concrete pavement on untreated rock base; portions of the existing roadbed to be surfaced with asphalt concrete pavement on existing pavements; and seal coats to be applied to provide a four-lane divided highway. District VII, Route 175. J. E. Haddock, Ltd., Pasadena, $366,062; Vido Kovacevich Co., South Gate, $367,571; Warren Southwest, Inc., Torrance, $395,213; Griffith Co., Los Angeles, $400,-377; C. O. Sparks, Inc., & Mundo Engineering Co., Los Angeles, $413,081. Contract awarded to M. S. Mecham & Sons, South Gate, $360,727.50.

MENDOCINO COUNTY—Across Ten Mile River, about 7.6 miles north of Fort Bragg, a timber trestle detour bridge on timber pile bents to be constructed. District I, Route 56, Section F. Lord & Bishop, Sacramento, $45,350; Al Erickson & Co., Napa, $48,296; Humboldt Constructors, Inc., Eureka, $49,930. Contract awarded to LeBoeuf-Dougherty Contracting Co., Richmond, $41,695.

MONTEREY COUNTY—Between 25 miles and 55 miles south of Monterey, 10 cattle passes to be replaced. District V, Route 56, Sections C, D, F. N. M. Saliba Co., Los Angeles, $68,860; Thomas Construction Co., Fresno, $74,296; Granite Construction Co., Watsonville, $86,715; C. B. Tuttle, Long Beach, $95,899. Contract awarded to E. G. Perham, Los Angeles, $58,796.50.

NAPA COUNTY—Between 1.9 miles north of Union Station and 2.7 miles south of Yountville, about 1.7 miles to be widened and surfaced with plant-mixed surfacing on cement treated base and existing Portland cement pavement to be resurfaced with plant-mixed surfacing. District IV, Route 49, Section B. E. A. Forde Co., San Anselmo, $94,839; Munn and Perkins, Modesto, $108,752; A. G. Raisch Co., San Rafael, $122,912. Contract awarded to J. Henry Harris, Berkeley, $94,299.

RIVERSIDE COUNTY—Between Route 64 and Nuevo Road, about 4.7 miles to be graded and surfaced with plant-mixed surfacing on cement treated base, two reinforced concrete overcrossings and nine reinforced concrete bridges to be constructed and highway lighting system to be installed. District VIII, Route 78, Sections C, Per, D. Matich Bros. & Matich Bros. Paving Co., Colton, $737,444; George Herz & Co., San Bernardino, $760,024; Ukropina, Polich & Kral, San Gabriel, $767,735; J. A. Payton Co., Riverside, $774,551; Griffith Company, Los Angeles, $803,991; A. Teichert & Son, Inc., Sacramento, $822,425; J. E. Haddock, Ltd., Pasadena, $925,640. Contract awarded to E. L. Yeager Co., Riverside, $725,672.65.

SAN BERNARDINO COUNTY—Between Euclid Avenue and Archibald Avenue, eight reinforced concrete bridges to be constructed. District VIII, Route 26. Guy F. Atkinson Co., Long Beach, $753,-588; Charles MacClosky Co., San Francisco, $765,-330; Ukropina, Polich, Kral, San Gabriel, $776,292; J. E. Haddock, Ltd., Pasadena, $826,253. Contract awarded to W. F. Maxwell, Los Angeles, $724,-873.10.

SAN BERNARDINO COUNTY—Between Route 192 and Pipe Line Avenue, about 5.1 miles, existing roadbed to be widened with imported base material and plant-mixed surfacing to be placed over existing surfacing and widened roadbed. District VIII, Route 77, Section A. R. A. Erwin, Colton, $73,940; E. L. Yeager Co., Riverside, $74,830; George Herz & Co., San Bernardino, $75,183; Matich Brothers, Colton, $82,700. Contract awarded to J. E. Roberts, San Bernardino, $72,275.

SAN DIEGO COUNTY—Between Del Mar and Encinitas, about 5.2 miles, additional roadway widths to be graded, cement treated base and plant-mixed surfacing to be placed and bridges across San Dieguito River and San Elijo Lagoon to be widened. District XI, Route 2, Section A. Griffith Company, Los Angeles, $704,888; J. E. Haddock, Ltd., Pasadena, $714,182. Contract awarded to R. E. Hazard Contracting Co., San Diego, $585,385.80.

SAN DIEGO COUNTY—Between 0.5 mile south of Nestor and Palm Avenue, in Palm City, about 1.1 miles to be graded and surfaced with plant-mixed surfacing on cement treated base and reinforced concrete bridge to be constructed. District XI, Route 2, Section G. R. E. Hazard Contracting Co., San Diego, $359,209. Contract awarded to Griffith Co., Los Angeles, $340,704.50.

SAN DIEGO COUNTY—Between 3 miles west of Route 77 and Route 77 at Miramar, about 3.2 miles to be graded and surfaced with plant-mixed surfacing on untreated rock base. District XI, Miramar Road. R. E. Hazard Contracting Co., San Diego, $223,494; Daley Corp., San Diego, $229,385; Griffith Co., Los Angeles, $255,280. Contract awarded to Cox Bros. Construction Co., Stanton, $216,962.20.

SAN FRANCISCO COUNTY—On 13th Street between Mission Street and Route 68, the superstructure and a portion of the substructure for a portion of a bridge and miscellaneous road work to be constructed. District IV, Route 2. Peter Kiewit Sons' Co., San Francisco, $2,926,032; Guy F. Atkinson Co., South San Francisco, $2,972,669; Granite Construction Co., Watsonville, $3,019,520; Fredrickson & Watson Construction Co. & M & K Corp., Oakland, $3,026,122; Bates & Rogers Construction Corp. & J. H. Pomeroy & Co., San Francisco, $3,026,-240; William & Burrows, Inc. & Carl N. Swenson Co., Inc., Burlingame, $3,188,967; Ukropina, Polich & Kral, Baldwin Park, $3,303,608. Contract awarded to Chas. L. Harney, San Francisco, $2,905,604.15.

SAN JOAQUIN COUNTY—Between Alameda county line and Janney Station, about 3.7 miles to be surfaced with plant-mixed surfacing. District X, Route 5, Section A. Stephens Trucking Co., French Camp, $109,865; Clements & Co., Hayward, $119,-975; Louis Biasotti & Son, Stockton, $124,629; Munn & Perkins, Modesto, $128,517; A. Teichert & Son, Inc., Sacramento, $128,752; J. Henry Harris, Berkeley, $129,168; Harms Bros., Sacramento, $136,032. Contract awarded to M. J. Ruddy & Son, Modesto, $109,595.80.

SAN LUIS OBISPO COUNTY—Between Bellevue School and Santa Fe Bridge intersection, about 0.24 mile to be graded and surfaced with plant-mixed surfacing on cement treated base. District V, Route 2, Section E. Granite Construction Co., Watsonville, $32,217; Madonna Construction Co., San Luis Obispo, $36,741; Thomas Construction Co., Fresno, $39,465; M. J. B. Construction Co., Stockton, $41,468; Walter Bros. Construction, San Luis Obispo, $46.068. Contract awarded to Hermreck & Easter, $29,765.15.

SAN LUIS OBISPO, MONTEREY, MADERA, KERN, TULARE, FRESNO COUNTIES—Sealing pavement joints at various locations. District V. Dana R. Tyson Co., Sacramento, $49,990; James M. Pope, Long Beach, $63,592; N. M. Saliba Co., Los Angeles, $63,936. Contract awarded to Concrete Pavement Maintenance Co., San Francisco, $45,832.

SANTA BARBARA COUNTY—Between three miles west of San Luis Obispo County line and San Luis Obispo County line, about 2.8 miles to be surfaced with road-mixed surfacing and bituminous surface treatment applied to shoulders. District V, Route 57, Section D. Granite Construction Co., Watsonville, $47,055; J. E. Roberts, San Bernardino, $52,975. Contract awarded to Hermreck & Easter, Santa Maria, $37,562.

SANTA CLARA COUNTY—Portions between Three Oaks Way near Saratoga and Main Street in Los Gatos, about 1.3 miles, to be surfaced with plant-mixed surfacing, untreated rock base and cement treated base. District IV, Route 42, Sections A, LGts. A. J. Raisch Paving Co., San Jose, $105,312; Leo F. Piazza Paving Co., San Jose, $106,194; Granite Construction Co., Watsonville, $132,479; J. Henry Harris, Berkeley, $132,558. Contract awarded to L. C. Smith Company, San Mateo, $103,479.60.

SANTA CLARA COUNTY—On Bayshore Highway at Taylor Street-Maybury Road, San Antonio Street, Story Road; and Tully Road, in and near the City of San Jose, full traffic-actuated signal system to be furnished and installed, highway lighting to be modified, and channelization to be constructed at two intersections, highway lighting to be furnished and installed at one intersection, and flashing beacons to be furnished and installed at one intersection. District IV, Route 68, Sections SJs, C. Howard Electric Co., Gilroy, $63,560; A. J. Raisch Paving Co., San Jose, $64,141; J. Henry Harris, Berkeley, $71,-269. Contract awarded to R. Flatland, San Francisco, $58,888.

SHASTA COUNTY—At Hatchet Creek, about 0.6 mile of existing roadway to be widened and portions surfaced with plant-mixed surfacing on cement treated base. District II, Route 28, Section C. O'Connor Bros., Red Bluff, $34,915. Contract awarded to Fredrickson & Watson Construction Company, Oakland, $33,446.20.

SOLANO AND NAPA COUNTIES—Between 0.7 mile east of Route 208 and Cordelia Underpass, about 5.5 miles, existing roadbed to be reinforced with cement treated base and surfaced with plant-mixed surfacing. District X, Route 7, Sections G, H, A. Fredrickson Bros., Emeryville, $339,230; Harms Bros., Sacramento, $351,618; Parish Bros., Benicia, $354,444. Contract awarded to Peter Kiewit Sons' Co., Arcadia, $335,592.

SONOMA COUNTY—At Tolay Creek, near Sears Point, about 0.1 mile of main roadbed and 0.1 mile of detour roadbed to be constructed and surfaced with plant-mixed surfacing. District IV, Route 208, Section A. A. G. Raisch Co., San Rafael, $24,484; J. Henry Harris, Berkeley, $25,994; E. A. Forde Co., San Anselmo, $26,297; Harms Bros., Sacramento, $26,861; Huntington Bros., Napa, $28,501. Contract awarded to Parish Bros., Benicia, $21,041.75.

SUTTER COUNTY—Between 0.2 mile west of Onstott Road and Route 3 in Yuba City, about one mile, a four-lane divided highway to be graded and surfaced with plant-mixed surfacing on cement treated base. District III, Routes 15, 3, Sections B, YC, YC. W. H. O'Hair Company, Colusa, $296,045; Harms Bros., Sacramento, $323,240. Contract awarded to Rice Brothers, Inc., Marysville, $279,-407.89.

TRINITY COUNTY—At China Slide, about 1.5 miles east of Burnt Ranch Post Office, C. R. B. aggregate to be furnished and stockpiled. District I, Route 20, Section D. Granite Construction Company, Watsonville, $64,750; M. W. Brown, Redding, $67,500; Clements & Co., Hayward, $70,000; E. W. Simpson, Auburn, $84,000. Contract awarded to R. P. Shea Company, Indio, $54,000.

TUOLUMNE COUNTY—At Moccasin Creek, about 4.6 miles south of the junction of Routes 65 and 40, a reinforced concrete bridge to be constructed and about 0.3 mile of approaches to be graded and surfaced with plant-mixed surfacing on untreated rock base. District X, Route 65, Section B. Charles S. Moore and Robert R. Murdoch, Oakland, $75,979; Friant Construction Co., Fresno, $83,773; Lefever and Bing, West Sacramento, $89,399; Wheeler Construction Co., Oakland, $114,419. Contract awarded to Beerman and Jones, Sonora, $68,264.

F. A. S. County Routes

ALAMEDA COUNTY—On Crow Canyon Road between Route 5 in Castro Valley and Contra Costa County line, about 6.7 miles to be graded and surfaced with plant-mixed surfacing. District IV, Route 801. M. J. B. Construction Co., Stockton, $451,957; Clements & Co., Hayward, $462,275; Close Building Supply, Inc., Hayward, $467,634; J. R. Armstrong, El Cerrito, $472,351; Fredrickson Bros., Emeryville, $497,556; McCammon-Wunderlich Co., Palo Alto, $504,806; Harms Bros., Sacramento, $521,905. Contract awarded to Fredrickson & Watson Construction Co., Oakland, $426,249.90.

NAPA COUNTY—On Silverado Trail between Oak Knoll Avenue and Parker Hill, about 2.2 miles, to be graded, imported borrow and untreated rock base to be placed and seal coat to be applied. District IV, Route 607. Harold Smith, St. Helena, $74,-063; E. A. Forde Co., San Anselmo, $74,242; Huntington Bros., Napa, $79,549; Slinsen Construction Co., Napa, $79,966; J. Henry Harris, Berkeley, $86,494. Contract awarded to Munn & Perkins, Modesto, $68,567.50.

SIERRA COUNTY—Between 6.9 miles and 5.2 miles west of Loyalton, about 1.8 miles to be graded, imported base material placed, and treated with portland cement and penetration treatment to be applied. District III, Route 524. Lefever & Bing, West Sacramento, $59,446; Joe Chevreaux, Auburn, $59,857; Claude L. Youngs, Sacramento, $63,875; J. Henry Harris, Berkeley, $64,345; O'Connor Bros., Red Bluff, $65,212. Contract awarded to Harms Bros., Sacramento, $59,190.

SONOMA COUNTY — Petaluma-Valley Ford Highway, between 4 miles and 5.4 miles westerly of Petaluma, about 1.2 miles, to be graded and surfaced with plant-mixed surfacing on imported base material. District IV, Route 777. E. A. Forde Co., San Anselmo, $122,113; Lefever & Bing, West Sacramento, $122,328. Contract awarded to J. Henry Harris, Berkeley, $113,257.50.

August, 1952

CALAVERAS AND TUOLUMNE COUNTIES—Between 2 miles northwest and 0.2 mile south of the Calaveras-Tuolumne county line, a bridge to be constructed across the Stanislaus River, and about 1.1 miles in net length, a portion on new alignment, to be graded and surfaced with road-mixed surfacing on untreated rock base over imported subbase material, and other portions to be widened to provide material for approach embankments to the bridge. District X, Route 65, Sections C, A. Eaton & Smith, San Francisco, $468,759; Nomellini Construction Co., Stockton, $440,878.50; Lord & Bishop, Sacramento, $319,551.90; Lefever & Bing, West Sacramento, $318,090. Contract awarded to Granite Construction Co., Watsonville, $271,759.

INYO COUNTY—At Olancha Maintenance Station, a well to be drilled and cased. District IX, Route 23, Section J. Evans Bros., Lancaster, $2,576. Contract awarded to Frank Rottman, Lancaster, $2,410.

KERN COUNTY—Between Bear Mountain Ranch and west end of Tehachapi Overhead, about 10.8 miles in length, to be scarified and surfaced with plant-mixed surfacing over cement treated base. District VI, Route 58, Sections E and F. Clements & Co., Hayward, $300,029; Clyde W. Wood & Sons, Inc., North Hollywood, $293,507.05. Contract awarded to Griffith Co., Los Angeles, $274,452.10.

LOS ANGELES COUNTY—City of Pasadena, on Colorado Freeway, between Avenue 64 and Holly Street, highway lighting and illuminated sign systems to be furnisbed and installed. Distrist VII, Route 161. Westates Electrical Construction Co., Los Angeles, $92,363; Electric and Machinery Service, Inc., South Gate, $91,765; C. D. Draucker, Inc., Los Angeles, $89,976; Newbery Electric Corporation, Los Angeles, $85,327. Contract awarded to Fischbach and Moore, Incorporated, Los Angeles, $79,386.

LOS ANGELES COUNTY—On Colorado Freeway in the City of Pasadena, between Avenue 64 and San Rafael Ave., a four-lane divided highway with frontage road and connections to be graded and surfaced with Portland Cement Concrete pavement and plant-mixed surfacing and three grade separation structures and a pedestrian undercrossing to be constructed. District VII, Route 161. J. E. Haddock, Ltd., Pasadena, $988,724.50. Contract awarded to Guy F. Atkinson Company, Long Beach, $958,873.

LOS ANGELES COUNTY—On Santa Ana Freeway, between 0.2 mile southeast of Lakewood Blvd. and Orr and Day Road, about 2 miles in length, to be graded and surfaced with Portland Cement Concrete pavement on cement treated subgrade; street connections, frontage road, inlets and outlets, and acceleration and deceleration lanes to be surfaced with plant-mixed surfacing on untreated rock base, and two over-crossing structures to be constructed to provide a freeway with a four-lane divided roadway. District VII, Route 166, Section A. Warren Southwest, Inc., Torrance, $1,119,942.20; Griffith Company, Los Angeles, $1,084,686.80; J. E. Haddock, Ltd., Pasadena, $1,077,453.40. Contract awarded to Ukropina-Polich Kral, San Gabriel, $958,841.50.

MADERA COUNTY—Between Arcola School and Madera, about 2.2 miles in length, cross-overs and road connections to be graded, imported base material to be placed and surfaced with plant-mixed surfacing, and right of way fence to be constructed. District VI, Route 4, Section A. J. Henry Harris, Berkeley, $95,273.50; Thomas Construction Company, Fresno, $84,697.20. Contract awarded to Baun Construction Company, Fresno, $82,473.

MONTEREY COUNTY—Across San Jose Creek and Dolan Creek, about 5 miles south of Monterey and about 6.5 miles north of Lucia, two existing bridges to be repaired. District V, Route 56, H, D. Bos Construction Co., Berkeley, $75,761.60; Barton Construction Company and K. S. Scheyer, Oakland, $54,322; N. M. Saliba Co., Los Angeles, $54,038; Laredon Const. Co., Los Angeles, $52,876.50; E. G. Perham, Los Angeles, $48,241. Contract awarded to Stolte, Inc., Monterey, $45,071.78.

SAN BERNARDINO COUNTY—At the intersection of Route 19 with Central Avenue, traffic signal system and highway lighting to be furnished and installed. District VIII, Route 19, Section A. Fischbach and Moore, Incorporated, Los Angeles, $17,961; Electric & Machinery Service, Inc., South Gate, $17,214. Contract awarded to Paul R. Gardner, Ontario, $16,931.

SAN BERNARDINO COUNTY—At Kramer railroad crossing, about 37 miles west of Barstow, about 0.5 mile of roadway to be graded and bituminous surface treatment to be applied. District VIII, Route 58, Section A. E. S. and N. S. Johnson, Fullerton, $49,936; Hubbs Equipment Company, Colton, $43,897.50; E. C. Young, San Fernando, $42,696; Matich Brothers, Colton, $37,032; Arthur A. Johnson, Laguna Beach, $34,829. Contract awarded to George Herz & Co., San Bernardino, $32,473.20.

SANTA BARBARA COUNTY—Across Santa Ynez River, about one mile north of Lompoc, repairs to an existing bridge, consisting of new piers, abutments, and spans to be constructed. District V, Route 56, Section C. Norman I. Fadel, North Hollywood, $286,816; Chas. McClosky Co., San Francisco, $274,730; O. B. Pierson, Bellflower, $251,-871.80; Dan Caputo, San Jose, $250,656; Granite Construction Co., Watsonville, $246,432; Thomas Construction Co., Fresno, $239,856.60. Contract awarded to Madonna Construction Co., San Luis Obispo, $221,592.

SANTA BARBARA AND SAN LUIS OBISPO COUNTIES—Between Montecito Separation and Park Place in Santa Barbara, portion between Hot Springs Canyon and Tequepis Canyon, and between 2.6 miles and 5 miles east of Route 56, a net distance of about 6.4 miles, plant-mixed surfacing to be placed on portion and a seal coat to be applied to other portions. District V, Routes 2, 80, 125, Sections B; A. Granite Construction Co., Watsonville, $25,778. Contract awarded to Valley Paving Company, Pismo Beach, $25,315.

SANTA CLARA COUNTY—Between Gilroy and 0.4 mile south of Sargent Overhead place protective screen planting in the areas within the medium strip and at bridge abutments. District IV, Route 2, Section C. Stephen L. Vistica, San Mateo, $11,-501.80; Watkin & Sibbald, San Anselmo, $11,474; Leonard Coates Nurseries, Inc., San Jose, $8,916.40; Justice-Dunn Co., Oakland, $7,502.28; Huettig-Schramm & Bennett, Inc., Palo Alto, $7,245.60. Contract awarded to Dana R. Tyson Co., Sacramento, $7,021.60.

SANTA CRUZ COUNTY—In the City of Santa Cruz, at Branciforte Creek, about 0.07 mile in length, the existing concrete bridge to be widened, the existing pavement to be widened with untreated rock base, and the widened portions and existing pavement to be surfaced with plant-mixed surfacing.

District IV, Route 56, in Santa Cruz. E. G. Perham, Los Angeles, $123,807.50; Dan Caputo, San Jose, $110,269. Contract awarded to Granite Construction Company, Watsonville, $92,272.

SOLANO COUNTY—Between Frese Corner and Putah Creek Bridge, about 2.6 miles in length, to be surfaced with plant-mixed surfacing. District X, Route 7, Section E. McGillivray Construction Company, Sacramento, $67,468.10; A. Teichert & Son, Inc., Sacramento, $53,290. Contract awarded to Fredrickson Bros., Emeryville, $42,242.50.

VENTURA COUNTY—Between Oakview Avenue and Route 151, about 2.3 miles in length, plant-mixed surfacing to be placed over existing pavement and on untreated rock base, and seal coat applied. District VII, Route 138, Section A. Baker and Pollock, Ventura, $47,745. Contract awarded to Jesse S. Smith, Glendale, $44,343.50.

YOLO COUNTY—Between 2 miles east of Yolo Causeway and Merkley Avenue, about 0.6 mile of storm drain system to be constructed. District III, Route 6, Section C. A. Teichert & Son, Inc., Sacramento, $51,394.50; B. J. Ukropina, T. P. Polich, Steve Kral, San Gabriel, $40,894; Lefever & Bing, West Sacramento, $38,199; L. G. Lentz, Sacramento, $35,805.60. Contract awarded to McGuire and Hester, Oakland, $32,826.

YOLO COUNTY—Between Esparto and Brown's Corner, about 12.2 miles in length, imported base material borders to be constructed, seal coat to be applied and existing drainage structures to be widened. District III, Route 50, Sections C and D. A. Teichert & Son, Inc., Sacramento, $212,753; B. J. Ukropina, T. P. Polich, Steve Kral, San Gabriel, $199,105.10; Harms Bros., Sacramento, $188,226.25. Contract awarded to Al. Erickson & Company and W. C. Railing, Woodland, $176,765.

YUBA COUNTY—Repairing a bridge across Yuba River at south city limits in Marysville. District III, Route 3, Section B, Marysville. Contract awarded to C. C. Gildersleeve, Grass Valley, $8,499.61.

F. A. S. County Routes

BUTTE COUNTY—Between Wade Road and Gridley, about 1.6 miles in length to be graded, imported base material and untreated rock surface to be placed and bituminous surface treatment to be applied. District III, Route 758. Contract awarded to Clements & Co., Hayward, $57,688.

GLENN COUNTY—Between Winslow Bridge at Stony Creek and Fruto, about 5.6 miles in length, to be surfaced with imported base material. District III, Route 531. W. H. O'Hair Co., Colusa, $91,185; O'Connor Bros., Red Bluff, $78,432; P. J. Moore & Son, Tracy, $64,255. Contract awarded to Lefever & Bing, West Sacramento, $61,970.

KERN COUNTY—Wheeler Ridge Road, between David Road and State Route 140, about 10 miles in length to be graded and surfaced with road-mixed surfacing on cement treated base. District VI, Route 574. Norman I. Fadel, North Hollywood, $427,622.50; Claude C. Wood Co., Lodi, $393,212.10; Granite Construction Company, Watsonville, $339,560; Clyde W. Wood & Sons, Inc., North Hollywood, $308,057.50; Baun Construction Company, Fresno, $280,890; Griffith Company, Los Angeles, $280,140.75. Contract awarded to Madonna Construction Co., San Luis Obispo, $254,155.

STANISLAUS COUNTY—On Lander Avenue, between the south city limits of Turlock and Merced County line about 2.2 miles in length, to be surfaced with plant-mixed surfacing. District X, Route 914. Standard Materials, Inc., Modesto, $29,935; B. J. Ukropina, T. P. Polich, Steve Kral, San Gabriel, $27,906.25. Contract awarded to M. J. Ruddy & Son, Modesto, $27,215.

SUTTER COUNTY—Between Striplin Road and Nicolaus Ave., about 3.0 miles in length to be graded, surfaced with imported base material and a penetration treatment and seal coat applied. District III, Route 1168. O'Connor Bros., Red Bluff, $133,557; Ted Schwartz, Grass Valley, $126,855; Clements & Co., Hayward, $115,745; P. J. Moore & Son, Tracy, $111,053.50; B. J. Ukropina, T. P. Polich, Steve Kral, San Gabriel, $109,167.15. Contract awarded to Lefever & Bing, West Sacramento, $105,000.

September, 1952

ALAMEDA COUNTY—In the Cities of Alameda and Oakland, approaches to Bay Farm Island Bridge, a graded roadbed to be constructed and surfaced with plant-mixed surfacing on untreated rock base, over imported subbase material, and install a highway lighting system. District IV, Route 226. J. Henry Harris, Berkeley, $366,222.50; Gallagher & Burk, Inc., Oakland, $310,271. Contract awarded to Fredrickson & Watson Construction Co. and M & K Corporation, Oakland, $306,029.15.

EL DORADO COUNTY—Across South Fork American River, about 2.3 miles north of Placerville, the existing reinforced concrete arch bridge to be repaired. District III, Route 93, Section A. Al Erickson & Co., Napa, $31,786; Friant Construction Co., Fresno, $31,206; Barton Construction Co. and K. S. Scheyer, El Cerrito, $30,405. Contract awarded to Lord & Bishop, Sacramento, $30,217.50.

FRESNO AND MADERA COUNTIES—Between Kingsburg and one-half mile north of Berenda, right of way fences to be constructed and concrete access delineators to be placed. District VI, Route 4, Sections A, Fow.,B.; A,B. United States Steel Co., American Steel & Wire Division Cyclone Fence Department, Oakland, $49,345.40; Pacific Fence Co., Los Angeles, $46,781.10. Contract awarded The California Wire Cloth Corp., Oakland, $44,463.38.

FRESNO COUNTY—Between Clinton Avenue and Biola Junction, about 2.6 miles in length, existing pavement to be surfaced with plant-mixed surfacing. District VI, Route 4, Section C. Gene Richards, Fresno, $41,295. Contract awarded Stewart & Nuss, Inc., Fresno, $35,010.

FRESNO COUNTY—At Enterprise Canal, and at Dog Creek, about 2 miles and 6½ miles respectively northeast of Clovis, a reinforced concrete bridge, a box culvert and road approaches to be constructed. District VI, Route 76, Section A. Trewhitt-Shields & Fisher, Fresno, $47,717.50. E. G. Perham, Los Angeles, $47,038; Friant Construction Co., Fresno, $41,629.25; Wheeler Construction Co., Oakland, $39,799.50. Contract awarded Paul E. Woof, Fresno, $36,827.

FRESNO COUNTY—At Sales Creek (Location 1) and at Big Dry Creek (Location 2) about 2.6 miles northeast of Fresno. At Location 1, a reinforced concrete box culvert to be constructed and about 0.15 mile of roadway to be graded and bituminous surface treatment applied; and at Location 2, a reinforced concrete bridge to be constructed and about 0.2 mile of approaches to be graded and bituminous surface treatment applied. District VI, Route 76, Section B. E. G. Perham, Los Angeles, $79,848.50; Trewhitt-Shields & Fisher, Fresno, $76,505.95. Contract awarded Thomas Construction Co., Fresno, $68,802.35.

HUMBOLDT COUNTY—In Richardson Grove State Park, at Durphy Creek, about 0.04 mile in length, to be graded and a field-assembled metal plate culvert to be furnished and installed. District I. O'Connor Brothers, Red Bluff, $25,000; Reed & Tuttle, Redwood Valley, $22,260; A. C. Johnson & Sons, Eureka, $21,494.50; Pike & Hill, Carey Bros. & Bailey, San Rafael, $20,721.75; E. A. Forde Co., San Anselmo, $19,713.50. Contract awarded Dana R. Tyson Co., Sacramento, $16,134.20.

KERN AND TULARE COUNTIES—Between Bakersfield and Fresno county line, right of way fences to be constructed, and concrete access delineators to be placed. District VI, Route 4, Sections G,E; B,F,E. Wulfert Company, San Leandro, $31,783.10; United States Steel Co., Oakland, $27,324.96. Contract awarded The California Wire Cloth Corp., Oakland, $24,056.70.

LOS ANGELES COUNTY—On Harbor Freeway at Pico and Venice Boulevards, in the City of Los Angeles, two reinforced concrete box girder bridges to be constructed and city streets to be graded and paved. District VII, Route 165. Webb & White, Los Angeles, $510,251; Norman I. Fadel, North Hollywood, $499,453.50; Byerts & Sons, and George K. Thatcher, Los Angeles, $496,216; Charles MacClosky Company, San Francisco, $495,705; George W. Peterson and Jack W. Baker, Los Angeles, $489,339; J. E. Haddock, Ltd., Pasadena, $477,872.90; J. A. Thompson & Son, Contractors, Inglewood, $465,945.20; W. J. Disteli, Los Angeles, $465,179. Contract awarded Oberg Bros. Construction Co., Inglewood, $454,637.

LOS ANGELES COUNTY—At the intersection of Whittier Boulevard with Pioneer Boulevard and with Coffman-Pico Road; Rosemead Boulevard with Rush Street and with Lower Azusa Road, and in and adjacent to the City of Whittier, Norwalk Boulevard with Beverly Boulevard, fixed-time traffic system, semi-traffic-actuated signal system, full-traffic-actuated signal system and highway lighting to be furnished and installed, and channelization to be constructed. District VII, Routes 2, 168, 170; Sections D,C,B,Wit. Westates Electrical Construction Co., Los Angeles, $55,012.50; Electric & Machinery Service, Inc., South Gate, $54,620. Contract awarded Fischbach & Moore, Incorporated, Los Angeles, $52,918.90.

LOS ANGELES COUNTY—City of Los Angeles, on Arroyo Seco Freeway, between Sunset Boulevard and College Street, and in the four-level area, highway lighting and illuminated sign systems to be furnished and installed, street lighting system to be modified, and existing circuits to be completed. District VII, Route 165. Fischbach and Moore, Incorporated, Los Angeles, $46,525; Electric and Machinery Service, Inc., South Gate, $45,110; Westates Electrical Const. Co., Los Angeles, $43,365; C. D. Draucker, Inc., Los Angeles, $41,333; Newbery Electric Corporation, Los Angeles, $40,898; Ets-Hokin & Galvan, Wilmington, $33,124. Contract awarded A. S. Schulman Electric Company, Los Angeles, $33,056.

LOS ANGELES COUNTY—On Arroyo-Seco Freeway, between Sunset Boulevard and College Street, about 0.4 mile, to be graded and paved with Portland cement concrete and asphalt concrete. District VII, Route 165. George W. Peterson and Jack W. Baker, Los Angeles, $645,298; Norman I. Fadel, North Hollywood, $531,642; Webb & White, Los Angeles, $479,934.50. Contract awarded J. E. Haddock, Ltd., Pasadena, $479,915.80.

NEVADA COUNTY—Between 2.1 miles west of Rough & Ready and 0.6 mile east of Rough & Ready, about 1.2 miles, existing road to be widened and penetration to be applied. District III, Route 15, Sections A,B. Joe Chevreaux, Auburn, $59,197.50; O'Connor Bros., Red Bluff, $42,791.80; J. Henry Harris, Berkeley, $39,399. Contract awarded Huntington Bros., Napa, $37,133.50.

ORANGE COUNTY—In City of San Clemente, at the intersections of El Camino Real with Avenida Palizada, and with Avenida Del Mar, traffic signal systems to be furnished and installed and modified. District VII, Route 2. C. D. Draucker, Inc., Los Angeles, $7,270; Electric & Machinery Service, Inc., South Gate, $7,019; Westates Electrical Construction Co., Los Angeles, $6,983; Fischbach & Moore, Incorporated, Los Angeles, $6,853. Contract awarded Ed. Seymour, Long Beach, $6,560.

ORANGE COUNTY—Removing palm trees on State highway between Seventeenth Street and Bay Street, in Costa Mesa. District VII, Route 43, Section A. Collins Equipment and Tree Service, Los Angeles, $7,025.78. Contract awarded Sam La Fon Tree Service, Gardena, $4,827.50.

PLUMAS COUNTY—Near Sloat Road, southeast of Spring Garden, mineral aggregate to be furnished and stockpiled. District II, Route 21, Section E. R. P. Shea Co., Riverside, $41,500; Rice Bros., Inc., Marysville, $32,500; M. W. Brown, Redding, $30,000; Allen & Reddy, Red Bluff, $29,500; Clements & Co., Hayward, $25,000. Contract awarded Floyd O. Bailey, Madera, $24,900.

SACRAMENTO COUNTY—Across Steamboat Slough and across Sacramento River at Isleton, about 5.7 miles north of Walnut Grove and 1 mile west of Isleton, two bridges to be repaired. District III, Route 11, Sections D,E. Bos Construction Co., Berkeley, $94,994.20; John C. Gist, Sacramento, $93,769; Al Erickson & Co., Napa, $92,676; D. M. Sandling, San Pablo, $91,751; Barton Construction Co., Oakland, $80,171.24. Contract awarded Payne Construction Co., Oakland, $74,896.80.

SAN BERNARDINO COUNTY—Between Yucca Station and Lakeview, 5 timber trestle bridges to be redecked with reinforced concrete slabs. District VIII, Route 31, Section N. George Herz & Co., San Bernardino, $53,751.50; E. G. Perham, Los Angeles, $47,037; John Strona, Pomona, $46,826; Norman I. Fadel, North Hollywood, $42,839.50; E. S. & N. S. Johnson, Fullerton, $42,211; Friant Construction Co., Fresno, $41,185; Laredon Construction Co., Los Angeles, $40,619; O. B. Pierson, Bellflower, $40,508.50; Owl Truck & Construction Company, Compton, $37,807. Contract awarded C. B. Tuttle, Long Beach, $36,807.50.

EARL WARREN
Governor of California

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FRANK B. DURKEE
Director of Public Works

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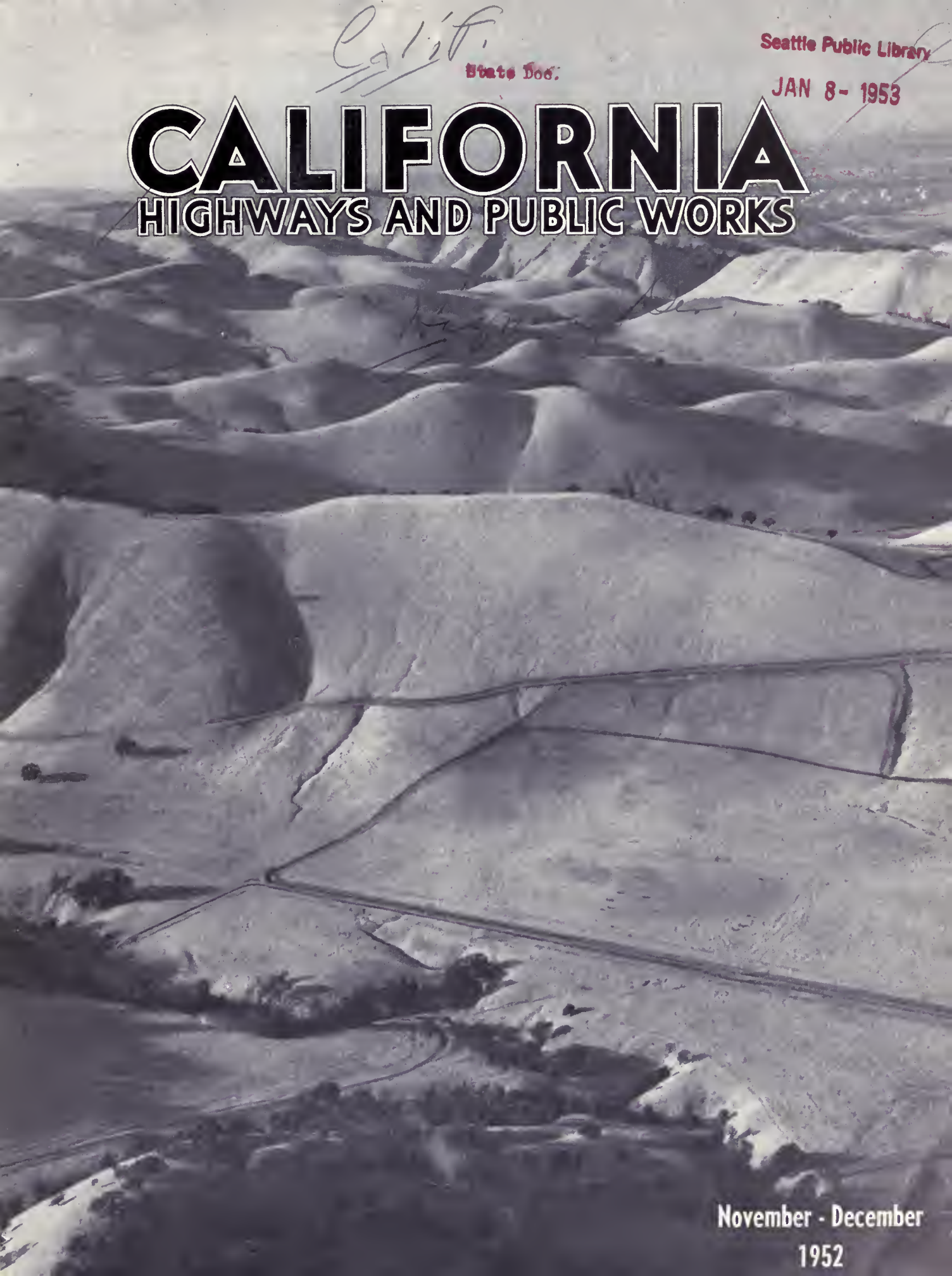
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Official Journal of the Division of Highways, Department of Public Works, State of California

FRANK B. DURKEE, *Director*
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From Old-time Streets to State-financed Freeways

BY FRANK B. DURKEE *
Director of Public Works

Urban Areas Now Get Increased Share of Funds

OUR PEOPLE frequently are neither aware of, nor perhaps interested in, which agency of government has jurisdiction over the surfaces on which they travel between origin and destination.

In California, we have about 20,000 miles of city streets, exclusive of state highways; approximately 67,000 miles of county roads; about 14,000 miles of state highways; together with a limited mileage of other public roads; a total motor vehicle transportation system over 100,000 miles.

There are states in which all of the rural mileage and some of the city streets are under a single system. But, in California, we reserve to local governments all the jurisdiction possible. This policy, however, poses a challenge. Efficiency and coordination must not be sacrificed for the mere sake of local control.

It has been my privilege in the course of more than 25 years as a state employee to observe that this challenge has been met, particularly in the last decade. We have achieved, under a system of three jurisdictions, a remarkable degree of efficiency. The answer is teamwork, based on mutual good will and understanding. In other words, the matter of jurisdiction can hardly be said to be one of California's street, road and highway problems today.

Highway Amendment of 1902

The people of California did not consider city streets a factor in their original thinking about state highways. Exactly 50 years ago, the people adopted Section 36, Article IV of the Constitution, empowering the Legislature to establish a system of state highways and to declare any county road a state highway and "to extend aid for the construction and maintenance in whole or in part of any county highway." It is to be noted that nothing was said about city streets.

Nor was anything said about city streets in the State Highway Bond Acts of 1909 and 1915, or the bond amendment of 1919. The language of these enactments spoke of highways running north and south through the State "connecting" the county seats and the centers of population.

This appears to have been no more than a reflection of the realities of intercity travel at the time. You left the "through" route, the state highway, when you entered the city, and you proceeded on city streets, usually the main business street, until you passed the city boundary again.

Far from receiving state funds for city street development, the tendency 30 years ago was for the cities to extend aid outside their own borders.

Out of the Mud

Meanwhile, as the State Highway System climbed out of the mud, motorists began to be increasingly aware of the difference between a highway, built with state funds to carry them across country, and a street, built with local funds and designed to serve local traffic, over which they had to travel on the same journey. The smaller and poorer the city, the rougher the trip between its boundaries. There was no need for signs at city boundaries. You knew it when you hit the chuck hole at the end of the state highway pavement.

First Highway Aid to Cities

The first state action to remedy this situation was taken in 1925. The Legislature directed the Highway Commission, upon the request of any city of 2,500 population, or less, to step in and improve up to the standards of the adjacent state highway any street carrying state highway traffic which the city was willing to dedicate for the purpose.

This legislative recognition of the through-traffic problem provided the cue for the Legislature and the Highway Commission to take the logical next step. In 1931, the commission began allotting funds to cities, on a cooperative basis, to enable them to obtain the wider and heavier pavements needed on those streets which connected the rural state highway routes. In 1933, this fund for cooperative projects amounted to the respectable total of $3,300,000 for the ensuing biennium.

The need for these cooperative funds was relieved by the action of the Legislature in 1933, when it required the commission to allocate one-quarter of a cent per gallon of the gasoline tax for the improvement of state highway routes within cities.

The next most important year for the cities probably was 1935, when the Legislature allocated another one-quarter cent per gallon of gasoline tax to the cities for expenditure on major city streets, other than state highways.

Also, the Legislature took cognizance of the fact that by virtue of the 1933 quarter-cent allocation it had become necessary to think of state highways as going through cities, not to and from cities. As a result, it enacted Section 111 of the Streets and Highways Code, which recognized this fact and spoke for the first time of the "natural course of a state highway" through a city. The Highway Commission was empowered to "determine the location of the connecting portion necessary to make the state highway continuous." The section significantly adds: "Such location may be either through or around such city, depending upon the commission's determination as to which location will be of the greatest benefit to through traffic upon such state highway."

Thus, in 33 years, the thinking had come almost full circle, from ignoring through traffic within cities to recog-

* From a talk by Mr. Durkee before the General Luncheon Session of the Annual Conference of the California League of Cities, San Diego, October 13, 1952.

nizing it as paramount as far as highway routing is concerned.

Collier-Burns Act

The next step was taken, in 1947, when the Collier-Burns Highway Act increased the allocation of gasoline tax funds to cities to five-eighths of a cent per gallon, all of it earmarked for city streets off the State Highway System. At the same time, the Legislature specifically provided that the state highway routes within the cities should remain the responsibility of the State, to be constructed and maintained on the same basis as all other state highways and with state funds.

For all practical purposes, the coin has now been completely reversed. In place of ignoring city streets as a state responsibility, we have come now to the actual creation of new city streets by the State, most of them of the freeway type. Freeways add much more to the city street system than their lane-mile totals indicate. They add far more capacity than an equivalent mileage of ordinary city streets, since they are designed to do their traffic-carrying job without the obstacles presented by parking, intersections, crossing and turning movements and stop and go signals.

Now that we have some freeway mileage within our cities, we wonder how we ever lived without them.

1951 Inventory of Highway Needs

As evidence of the tremendous reversal in thought about state responsibility for highways through cities, I should like to call attention to the chart entitled "1951 Inventory of State Highway Needs." The Division of Highways at the request of the Legislature submitted last year, that is, 1951, a detailed list of state highway deficiencies. As the chart shows, this study indicated that one and six-tenths billion dollars would be required to bring the state highways outside of cities up to satisfactory standards of safety and capacity.

It was estimated also that nearly an equal amount, one and four-tenths billion dollars, would be required to bring the state highways inside cities up to adequate standards. The recognition of these needs within cities, in the official planning of our state highway development, represents a vast change from the early conception of the State Highway System.

The comparative mileages percentage wise, of state highway inside and outside cities further underline the contrast between the past and present. The total mileage of state highways in California is 13,986. Of this total, 12,767 miles, or 91 percent, lie outside incorporated cities; and only 1,219 miles, or 9 percent are located inside cities. You will note from the chart that the mileage of deficiencies, or needs, is in about the same ratio. The mileage of the State Highway System in need of improvement as of last year came to 11,298. Of this deficient mileage, 10,475 miles are outside cities and constitute 93 percent, and 823 miles are inside cities, and represent 7 percent of the mileage deficiency.

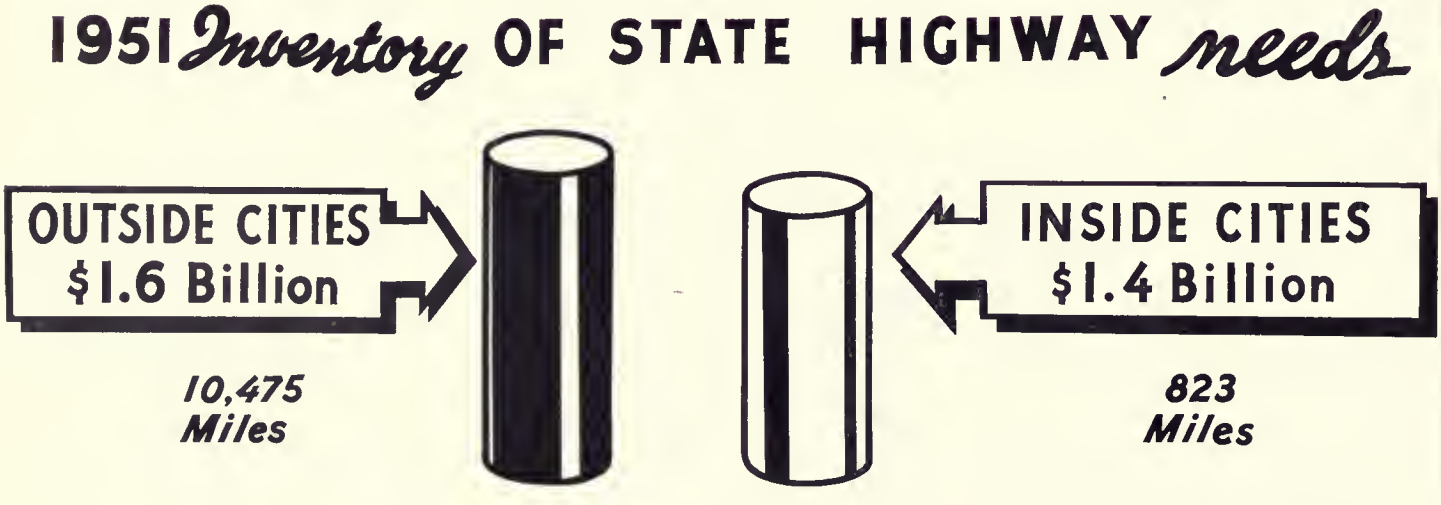
As the two columns on the chart further indicate, the cost of making our state highways adequate for today's traffic would average some $153,000 per mile outside cities, and $1,700,000 per mile inside cities. These figures are useful only for purposes of illustration, as there is no such thing as a "typical" mile of state highway, especially in urban areas.

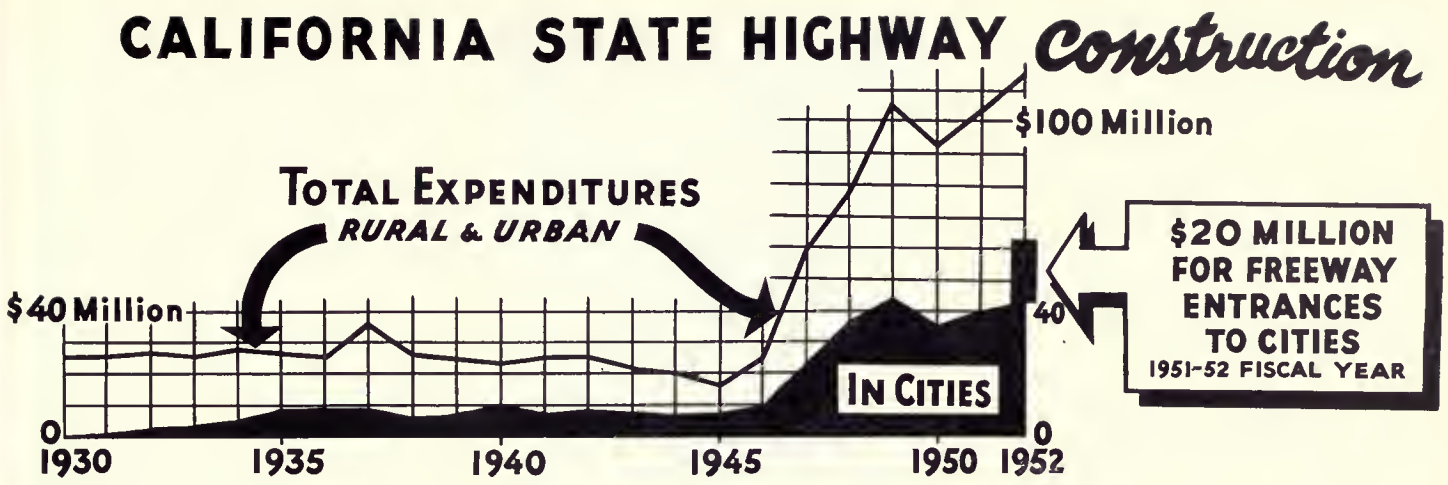
Reasons for this wide variation between rural and urban highway needs and costs are obvious. In the cities, where traffic counts on some freeway sections have already exceeded 100,000 vehicles in a 16-hour period, additional lanes are necessary; traffic interchanges are more complicated; structures are more numerous, wider and longer; and right of way costs are a great deal higher.

Construction Chart 1930-1952

The increasing and continuing attention to the transportation needs within cities is demonstrated by the other chart entitled "California State Highway Construction," which shows the expenditures for state highway improvements, including costs of rights of way, from 1930 through 1952.

You will note that in 1930 the total construction expenditures for state highways, both rural and urban, were about 25 million dollars. Of this total, less than a million dollars was expended inside cities. Expenditure of state highway funds within cities at that time was limited to places of 2,500 population, or less, in accordance with the legislative authorization of 1925.





Following the authority vested in the Highway Commission by the Legislature in 1931, allocations for cooperative city projects on state highway routes in cities began to be made without limitation as to size of the city. In the 1931-32 Fiscal Year, nearly a million dollars was expended out of an initial $2,750,000 cooperative fund. A further cooperative fund allocation of $3,300,000 for city projects was made by the commission prior to the passage in 1933 of the one-quarter cent per gallon gasoline tax allocation for improvement of state highway routes through cities.

Progress Stepped Up

Since 1947, progress in state highway improvement has stepped up in comparison with preceding years. In the first five years of operation under the Collier-Burns Highway Act, ending June 30, 1952, a total of over $500,000,000 was expended or obligated for state highway improvement. Of this amount, approximately $200,000,000 was devoted to state highway routes in cities.

The chart shows the continuing increase in state highway expenditures through cities culminating in the current 1952 expenditure of more than $43,000,000 out of a total construction and right of way budget of some $116,000,000.

In addition, since 1947, a total of $87,802,000 of State Highway Fund moneys has become available for expenditure on city streets, apart from state highways. This total has accrued from the five-eighths of a cent of gasoline tax for city streets provided in the Collier-Burns Act.*

I should like to point out to you that the amounts cited as expended within cities apply to the corporate limits of the municipalities. In addition to the amounts allocated for expenditure within incorporated limits, upwards of $20,000,000 in construction projects were included in the 1951-52 Fiscal Year budget for major highway developments adjacent to cities in fringe areas. The need for such projects in these areas and their importance to the cities, is recognized, I am sure, by all.

Problem of Tronsportation

The inventory of state highway needs gives us a target at which to shoot. But it reveals only one segment of a complex and many-sided problem. The time is coming, if indeed, it is not already here, when the highway problem can no longer be dealt with as a clear-cut, independent field, but rather one that must be treated as an integral part of the broad problem of transportation as a whole. To some extent this has always been true; but, whereas, in the past our network of roads, streets and highways has been generally considered as existing alongside other transportation facilities and supplementary to them, now the whole transportation problem has become so interwoven that its various components cannot be fully isolated one from another.

* During the same period there was apportioned to the counties for county road purposes from the Highway Users Tax Fund a total of $234,955,000.

The function of our transportation system is to move people and goods safely and expeditiously, when and where desired. That means all the way from origin to destination.

The Chamber of Commerce of the United States recently estimated that the mileage traveled by passenger automobile for the first six months of 1952 increased nearly 7 percent over the same period last year. This percentage was higher in California. At the same time, local commercial traffic—transit lines, suburban busses and commuter trains—showed a decrease of 6 percent. Everywhere, as the national chamber points out, common carriers have found it difficult to keep pace with the increase in the use of passenger automobiles, both in local and intercity travel.

We have no idea how far this trend will take us. We do know that in California we had a little over 2,000,000 motor vehicles registered in 1930; about 3,000,000 in 1940; and an estimate of 5,500,000 or more for 1952. California vehicle registration exceeds that of New York State, and is 10 percent of the U. S. total. In the seven years since World War II, motor vehicle registration in the United States increased 70 percent; in California, in the same period, it increased 80 percent. Is it any wonder we have a traffic problem?

Population Figures

In 1940, California had a population of less than 7,000,000. In 1950, more than 7,000,000 lived in our cities alone, with rural population bringing the total for the State to 10,586,000. The latest available estimate of the State's population is about 11,000,000. The State

Chamber of Commerce has forecast a population figure of more than 14,000,000 by 1960, with a registration of 6,500,000 motor vehicles.

The travel on our state highways alone, in 1951, amounted to the fantastic figure of more than 48,000,000,000 vehicle miles. This is almost exactly double the mileage of vehicular travel on our highways in 1940. Again, I say, is it any wonder we have a traffic problem?

Obviously, we have not been able to provide the street and highway facilities required by this tremendous and continuing increase in people and vehicles.

In rural areas, the transportation problem is still one where adequate highways can play a major role in the solution. Highways are doing a pretty good job, within financial limitations, in getting people and goods from city to city. In these rural areas, transportation by motor vehicle is basically a state highway affair. The network of other roads is built around the state highway, which follows the historic main route, between centers of population. Vehicles flow into, along and out of the highway traffic stream, and where the highway has been constructed to adequate standards for today's traffic, there is little congestion and a good level of safety.

Multilane Highways

For example, the highway portion of the transportation system between Los Angeles and Sacramento is doing the job it should, in greater and greater measure. Of the 384 miles of U. S. Highway 99 between those two cities, a total of 236 miles have been constructed to divided multilane standards. An additional 29 miles are under construction.

But when U. S. 99 enters Los Angeles, or Sacramento, something happens. It ceases to dominate the transportation picture; instead, it becomes just another congested city street.

In our cities, which have two-thirds of California's total population, and in large suburban communities around about, the "when and where" of our transportation goal becomes a problem of connecting streets, and also a problem of where to put the car until it is needed for the return trip. The freeway obviously has not supplied the full solution, and it is doubtful that it ever will. It reduces the nerve-wracking congestion en route; but in so doing, it has served to spotlight the collateral problem of parking, or space for parking. With our motor vehicle registration mounting steadily, we are now beginning to provide the traffic lanes necessary to carry cars in motion, but there is always the question of space for cars at rest. It is inevitable that answers to the transportation problem, other than highway improvement, must be considered.



FRANK B. DURKEE

The freeway permits movement of vehicles, but it is mass transportation that moves individuals.

Future Studies

There is no doubt that future consideration of California highway needs will go beyond the scope of past studies. The Joint Legislative Highway Fact-finding Committee has been authorized to expand its current investigation to include roads and streets under local jurisdiction.

The Institute of Transportation and Traffic Engineering at the University of California has been requested to submit to the State Assembly next year a prospectus for a study of metropolitan transportation problems.

Relief for Congestion Demanded Now

In the meantime, we must continue to work, as far as the available funds permit, toward the relief of congestion and the reduction of the accident hazard on our state highways, including the routes within cities. The traffic which needs freeways now simply cannot wait until the over-all metropolitan transportation answer is found and applied.

The Highway Commission has a legislative mandate to provide for the needs of through traffic.

Another mandate has come from the Federal Government, which since 1944, has provided funds for expenditures in urban areas on highways on the Federal Aid Primary System. In the next two years, the allocation for urban federal aid highways in California is estimated at $11,837,000 per year, to be matched by state funds. The Bureau of Public Roads has just issued the following statement of policy with regard to these expenditures in urban areas:

> "Improvements to be financed under provisions of Federal Aid Highway Act of 1944, and subsequent acts, with funds authorized for expenditure only in urban areas, are intended to be substantial in character and of benefit to the involved municipality. Projects which accomplish only incidental improvement, and do not result in increased traffic capacity, shall not be financed with urban funds."

This is a policy with which the California Highway Commission is in hearty agreement. Even though short-term improvements have had to be provided on occasion to meet a genuine emergency, it has always been with regret that the commission has seen long-range highway improvements, designed to provide additional capacity, thus deprived of their full share of the limited funds available.

Advance Planning and Fiscal Policy

The Legislature has taken the same view. In 1943, it put into law its thinking about the orderly and planned development of the State Highway System, and the way in which it wants the solution to our highway problems approached. Section 70.2 of the Streets

. . . Continued on page 37

Industrial Freeway

Fourth Link of the Arnold Highway Ready Next Spring

By D. M. YOUNG, Resident Engineer

THE FOURTH LINK of the "Arnold Industrial Highway" in Contra Costa County is being rapidly forged in the construction of the Pittsburg-Antioch Freeway.

The freeway is being constructed over fairly flat terrain of the once large Rancho Los Medanos. The Rancho Los Medanos (Medanos meaning sand hills) consisted of nearly 9,000 acres lying in Township 2 North, Range 1 East of the Mt. Diablo base and meridian. The land was first granted to the Mesa brothers by the Mexican government in 1839. Change of ownership occurred frequently from 1850 until 1900 when it was secured by Charles A. Hooper, and has since been operated by the C. A. Hooper Land Company. Industrial and residential expansion together with the creation of the Camp Stoneman staging depot by the United States Army has absorbed considerable acreage of the initial land grant.

The Pittsburg-Antioch area with extensive water and rail facilities, and the immediate prospect of improved highways, has been rapidly expanding as an industrial unit of the larger San Francisco Bay area.

Antioch Founded in 1850

Antioch was founded in 1850 by pioneers sailing from Maine seeking agricultural lands. The original townsite was laid out and streets named after these pioneers. Later, these street names were replaced by numbered and alphabetical nomenclatures, an attempt at modernization which now is being defeated by tract development with personal names being given the newly developed streets.

Pittsburg, situated at the confluence of the Sacramento and San Joaquin Rivers, was thus officially named in 1911 three years after the founding of the local Columbia Steel Company plant. Originally known as New York Landing, it carried the nomenclature of Black Diamond during the active period of the coal industry.

Approximately four miles southerly of the Pittsburg-Antioch section lies the Diablo soft coal field where once flourished the towns of Nortonville, Sommersville and Stewartville from 1860 until 1902. The coal was transported to the waterfront by three narrow-gauge gravity railroads whence it was shipped by cargo vessels; water being the only transportation available until the advent of the first through railroad in 1878.

Southern Pacific spur track overcrossing, showing freeway paving operations in progress



Eliminate Bottleneck

In the latter part of the nineteenth century, development of hard coal mines in Oregon and Washington coupled with water seepage and land slides in the Diablo mines foreshadowed their demise.

The bottleneck created by the temporary connection to the City of Pittsburg at the easterly limits of the present freeway will be eliminated by the diamond interchange now being constructed at Railroad Avenue. Commercial traffic in the large and rapidly expanding Pittsburg-Antioch industrial area will be served by this project as well as "through" traffic from the Delta lands of the Sacramento and San Joaquin Rivers to the Bay area. Grade separation structures together with on and off ramps will provide convenient accessibility for the traveling public.

Work was started under this contract on February 25, 1952, by Peter Kiewit Sons' Company of Omaha, Nebraska, and is being supervised by George Premo, Jr., General Superintendent, and Gene Neville, Project Engineer, working out of the division office in Arcadia, California. Progress has been good and it is anticipated the project will be completed about May, 1953, thus utilizing approximately half the 400 working days allotted by the contract.



Looking east from railroad spur track overcrossing, which also will accommodate vehicular crossing of Incinerator Road →



Looking west from Harbor Street overcrossing. Railroad Avenue overcrossing and portion of previously completed freeway in background. Camp Stoneman on left. ←

Divided Four-lane Highway

The project, five miles in length from the southerly city limits of Pittsburg to the easterly portion of Antioch, consists of a divided four-lane portland cement concrete pavement with shoulders, ramps and service roads of plant mixed surfacing.

Numerous structures, including the following grade separations, are being constructed as part of the project.

RAILROAD AVENUE OVERCROSSING is a reinforced concrete flat slab type structure supported on reinforced concrete abutments and center bent on reinforced concrete spread footings.



UPPER LEFT—Looking west from Camp Stoneman underpass with Harbor Street and Railroad Avenue overcrossings in background. UPPER RIGHT—Southern Pacific spur track overcrossing, showing freeway paving operations in progress. LOWER LEFT—Intersection of California Avenue with existing State Highway Route 75, about 1.5 miles east of Pittsburg. LOWER RIGHT—Stewartville Road underpass, looking north toward Antioch.

A diamond type interchange is to be constructed with ramps, signals and lighting to provide free traffic flow at this intersection.

HARBOR STREET OVERCROSSING is similar in construction to the Railroad Avenue structure serving Camp Stoneman.

CAMP STONEMAN ROAD UNDERPASS is a structural steel through-girder railroad underpass and a structural steel rolled beam overcrossing. The

dual structure will serve rail and vehicular traffic within the several portions of Camp Stoneman.

STANDARD OIL ROAD UNDERCROSSING consists of a pair of similar parallel reinforced concrete slab type bridges supported on common reinforced concrete abutments on spread footings.

STEWARTVILLE ROAD UNDERCROSSING consists of a pair of similar, parallel, reinforced concrete slab type bridges.

A semidiamond type interchange with lighting and connecting ramps will provide for ingress and egress westerly on the freeway.

H STREET OVERCROSSING consists of a reinforced concrete tee-beam type of bridge with two equal clear spans, each supported on reinforced concrete type abutments and center bent on spread footings.

A semidiamond type interchange will be constructed similar to that at Stewartville Road.



TOP—Section of Arnold Industriol Freeway, looking west, showing contractor's concrete batching plant on right. BOTTOM—Stewartville Road undercrossing, looking north. →



Showing easterly terminus of current freeway construction entering Antioch near A Street ←

Grade Crossings

Channelized grade crossings will be constructed at the Somersville Road and Lone Tree Way intersections. A temporary wye-type connection will be provided to A Street in Antioch at the easterly terminus of this project.

Concrete used in bridge structures and culverts is being mixed in a central mixing plant located midway of the project and hauled to the structures in "dumpcrete" trucks. Air entrainment is being used to prevent segregation of aggregates.

The geometric section of the roadway consists of four 12-foot lanes with 8-foot outside shoulders and a median strip varying in width from a minimum of 12-foot curbed division to 40-foot open division. The surfacing is 8 inches of portland cement concrete placed on 10 to 16 inches of imported base material, of which the top 4 inches is treated with cement. Shoulders will be

. . . Continued on page 64

Long Beach Freeway

Progress Report on Construction Operations

By W. L. FAHEY, District Engineer

In the May-June, 1951, issue of *California Highways and Public Works* there was a story entitled "Moving Forward" by District Engineer M. E. Cessna, written before start of construction, that gave a general description of the inception and development of the Los Angeles River Freeway, as it was then called. This story was published with an illustrative map and with photographs descriptive of this 16.2-mile freeway route extending southerly from the Santa Ana Freeway to Pacific Coast Highway in the City of Long Beach.

Now Long Beach Freeway

While the original name of this freeway, which will be State Highway Route 167 replacing the present routing along Atlantic Boulevard as shown on various maps, was Los Angeles River Freeway, the Los Angeles County Board of Supervisors some months ago adopted a resolution officially changing the name to Long Beach Freeway. The new designation is logical because the southerly terminus of this freeway is in the City of Long Beach. This new name has been well received by local people, and it appears particularly appropriate because of the accomplishments of Long Beach in developing this freeway, especially the southerly extension thereof beyond Pacific Coast Highway that is inside the city but not on the State Highway System.

At the time the prior story was written, bids had just been received for the first major unit of construction on this freeway, extending from Pacific Coast Highway northerly 2.5 miles to 223d Street. Subsequently, award of this contract was made to Griffith Company and five other contracts have been awarded, so that at the present time

Portland cement concrete batch plant used in construction operations on Long Beach Freeway, located just beyond north end of project



there is a total of $4,500,000 in construction contracts now in progress.

Bids Opened

Bids were opened on November 6, 1952, in the District VII Los Angeles office for grading, paving, and five bridge structures on the Long Beach Freeway from 223d Street northerly 4.5 miles to the south junction with Atlantic Avenue in the City of Compton. Bids were received from seven contractors. The low bid was submitted by Ukropina, Polich & Kral with the total of the contract items being $2,559,019. Since this contract carries a time limit of 380 days, we can reasonably expect completion by July, 1954. At this time we will then have completed and open to public traffic full freeway construction for seven miles from Pacific Coast Highway in Long Beach to Atlantic Avenue in Compton.

Radio and television newscasts have made us familiar with the procedure of having reporters on the ground tell their own stories about current happenings. Therefore, we are now having Resident Engineer H. F. Meinke report on the activities on the Long Beach Freeway involving road construction, Supervising Bridge Engineer J. E. McMahon report concerning bridge construction, and Jess D. Gilkerson, City Engineer of Long Beach, report concerning the activities of the City of Long Beach on this freeway for that southerly unit which is not on the State Highway System. Their reports follow:

REPORT BY H. F. MEINKE

On May 31, 1951, State Highway Contract 51-7VC49-F in the amount of $1,429,146 was awarded to Griffith Company for constructing the first unit of the Long Beach Freeway, about 2.5 miles in length, providing for a six-lane grade-separated divided highway in the City of Long Beach, between Pacific Coast Highway, State Route 60, and 223d Street. This portion of the freeway is adjacent to the westerly levee

Looking northerly along Long Beach Freeway, showing paving operations in progress in vicinity of crossing with Willow Street





Looking southeasterly along Long Beach Freeway, showing grade separation and traffic interchange facilities at Belhart Avenue Crossing

of the Los Angeles River, which forms a natural barrier to cross traffic except at the three main existing bridge crossings at Pacific Coast Highway, Willow Street, and Belhart Street.

The main items of work on this contract consist in general of constructing a graded roadbed; surfacing with Portland cement concrete pavement on cement treated subgrade over imported base material; placing plant-mixed surfacing on shoulders; constructing accelerating and decelerating lanes and interchange roadways surfaced with plant-mixed surfacing on untreated rock base over imported subbase material; placing plant-mixed surfacing on plant-mixed cement treated base; and constructing a new reinforced concrete box girder type of bridge consisting of three spans supported on reinforced concrete bents on untreated timber and concrete piles. Other miscellaneous items of work consist of drainage structures; plant-mixed surfacing curbs and ditches; concrete curbs, gutters, sidewalks and driveways; concrete pipe culverts; and six-foot chain link fence.

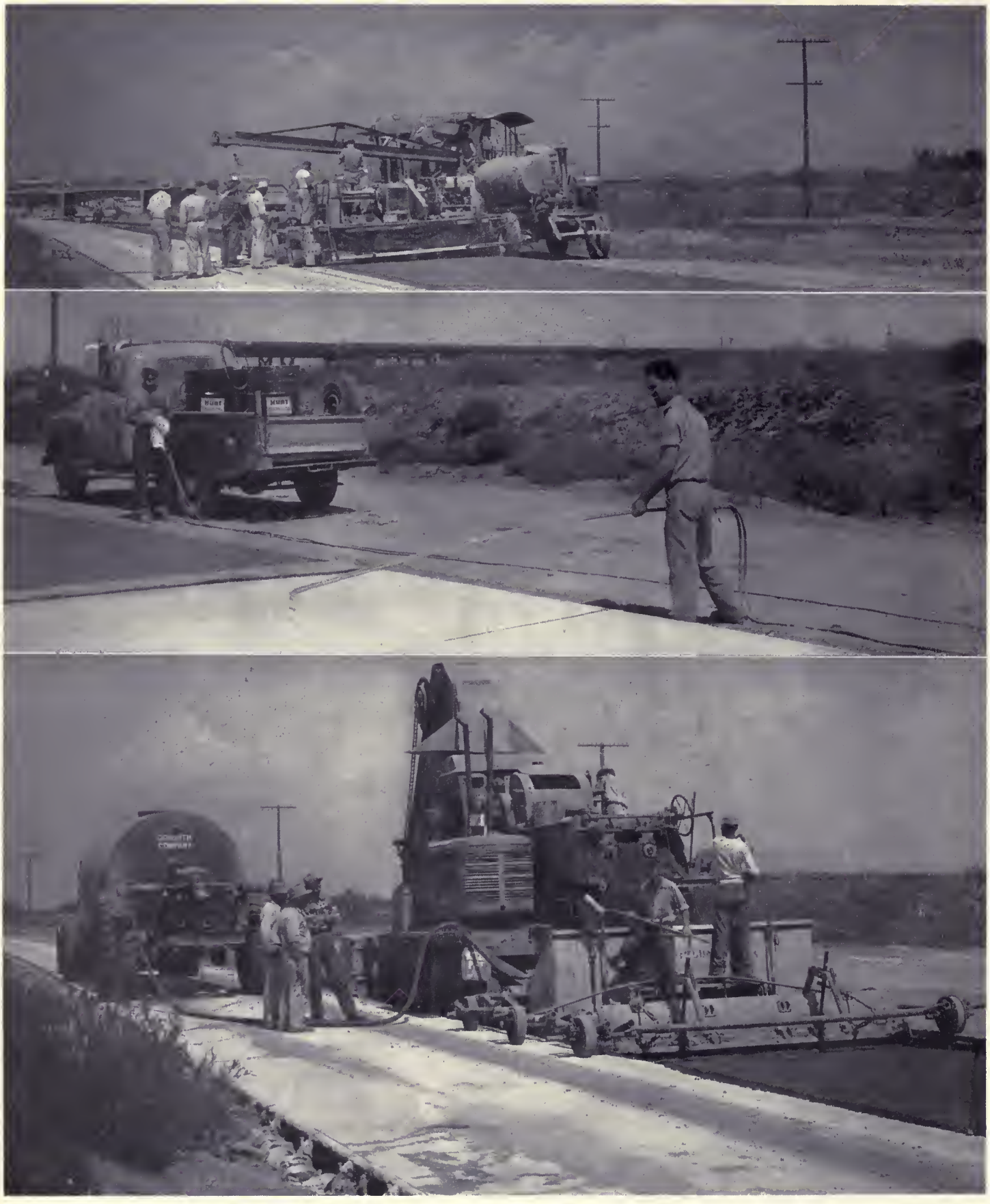
Detour Constructed

The first order of work was to construct an initial detour around the existing grade separation at Pico Avenue and Pacific Coast Highway to permit the removal of the old bridge. The final stage of the detour was then constructed around the State Highway Route 60/167 overcrossing for the use of public traffic until the completion of the new structure was accomplished. The fill material placed in the detour was later salvaged and used for the construction of roadway embankments for on and off ramps at the Pacific Coast Highway grade separation.

An interesting sidelight in connection with the excavation for the bridge footings was the exposure of free gasoline at elevation −1 foot in the bottom of the excavation. At various times it was necessary for the contractor to pump out this free gasoline and dispose of it in a safe place in order to reduce fire hazard. The consensus of opinion seems to be that the origin of the gasoline was due to accumulated leakage from one or more of the many oil lines in this area. To date all oil companies that have pipelines in the vicinity have disclaimed all responsibility for this gasoline.

Fill Materials

Past experience with fill materials in this coastal plain area has shown that difficulty with roadway embankment construction might be expected due to the deposition of layers of clay material, because during the wet season



UPPER—Canstructian aperatians an freeway, showing placing of portland cement concrete pavement with 34-E twin botch paver, mechanical spreader, and mechanical tamper. Willaw Street Bridge in backgraund. CENTER—Showing application of grey pigmented sealing compaund to newly placed pavement. LOWER—Showing Barber-Greene traveling plant mixing imported base material with water and cement.



UPPER—Showing the placing of steel side forms adiacent to previously laid lane of partland cement cancrete. Belhart Street Bridge in backgraund. CENTER—Shawing applicatian af asphaltic emulsian seal to freshly laid cement treated subgrade. LOWER—Shawing subgrader and windraw sizer cutting subgrade and sizing windraw in preparation far cement treoting.



ground water rises to within two feet of the surface of the natural ground and saturates the upper two feet. To insure a firm, stable roadbed under the pavement, the grade line was established approximately three feet above the existing ground surface. Because of this procedure, 115,000 tons of imported borrow was required to complete the roadway embankments.

At the present time the contract is approximately 90 percent complete. Portland cement concrete curb and gutters in the vicinity of the three traffic interchange structures, plant-mixed surfacing of shoulders and ramps, pneumatically applied mortar, erosion control, six-foot chain link fence and finishing roadway are the items of work still remaining to be done. A temporary on-connection at Wardlow Road and a temporary off-connection at 223d Street will be provided to facilitate traffic flow when the project is completed, which is expected to be in mid-December, 1952.

REPORT OF J. E. McMAHON

The State Highway Route 60/167 separation structure, which carries U. S. Route 101 Alternate (Pacific Coast Highway) over the freeway, has been



UPPER—Looking southeosterly, showing construction in progress under Long Beach contracts. Anaheim Street crossing in center. LOWER—Looking northerly at crossing with Pacific Coast Highway.

completed. This is a three-span reinforced concrete structure on concrete piles. The structure was included in the state highway contract with Griffith Company of Los Angeles for that portion of the Long Beach Freeway between State Route 60 and 223d Street. The State's Resident Engineer was F. M. Morril.

The Dominguez Street Underpass which is now under construction carries the Union Pacific Railroad and the Pacific Electric Railway over the Long Beach Freeway, close to the intersection of these two railroads. The project consists of two separate bridge structures with a common abutment at the east end of the bridges. The structures consist of steel plate girder spans supported on reinforced concrete piers and abutments supported on concrete piles. At present, work is in progress on the construction of temporary tracks to carry railroad traffic around the site of the proposed structures. Webb and White are the contractors on this project. Their bid price was $1,155,929.50. All work under this contract is expected to be completed in March, 1954. The Resident Engineer is N. B. Hallin.

Compton Creek Bridge

The bridge which will carry freeway traffic over Compton Creek is also under construction. This is a three-span reinforced concrete box girder bridge on concrete piles, and is now about 50 percent complete. The Del Amo Undercrossing is also under construction and is approximately 85 percent complete. It is a single-span reinforced concrete T-beam structure on concrete piles. The construction of the Compton and Del Amo structures was included in a single contract awarded to R. M. Price Company of Altadena at a cost of $508,656. The contract is expected to be completed in February, 1953. H. K. Mauzy is the Resident Engineer.

The State Highway Route 175/167 separation structure will carry Artesia Street traffic over the freeway. This separation structure is a four-span reinforced concrete box girder bridge, supported on concrete piles. It is now 50 percent complete and is expected to be completed by April, 1953. The Resident Engineer is C. B. Oustad.

The construction of the section of the Long Beach Freeway from 223d Street to Atlantic Avenue, for which bids were opened on November 6, 1952, includes the construction of the Carson Street Undercrossing, Edison Undercrossing, Edison Road East Undercrossing (off-ramp), Edison Road West Undercrossing (off-ramp), and the Atlantic Avenue Undercrossing.

REPORT BY JESS. D. GILKERSON

The extension of the Long Beach Freeway southerly from Pacific Coast Highway (Route 60) requires special mention because it is the only instance to our knowledge in the postwar era where any governmental agency other than the State Highway Department is carrying out the construction and financing of a modern freeway in the Los Angeles metropolitan freeway system. This condition results primarily from the fact that the southerly terminus of the freeway (Route 167) as a state highway is Pacific Coast Highway. However, even prior to the incorporation of the freeway in the State Highway System, the City of Long Beach had been protecting the alignment by acquiring rights of way throughout its entire length within the city with resultant extremely low acquisition costs per mile.

The early construction of the freeway, which will provide for a high-speed through artery between the two largest cities in Los Angeles County, with its great traffic generating power is expected to have a terrific traffic impact on our downtown business district. To this end, the city is now engaging a nationally known traffic engineering firm to assist us in devising an adequate means of distributing this traffic into both our harbor and central business districts, as well as to advise on the related problems of mass transportation terminal facilities and off-street parking.

Bridge and Freeway Ramp

The accompanying illustration is a photograph of one of our preliminary studies of the proposed bridge and freeway ramp system from Anaheim Street south to Seaside Boulevard. This particular study visualizes separation of the major traffic movements into the business district east of the river from the harbor traffic on the west side of the river by means of a diagonal bridge in the general vicinity of Ninth Street.

. . . Continued on page 37

Photograph of one of preliminary studies for southerly extension of Long Beach Freeway and distribution system into the main business district of Long Beach



Norwalk Diagonal

Strategic Link of Santa Ana Freeway Now Being Constructed

By M. E. CESSNA, District Engineer

At the time the progress report on the Santa Ana Freeway, by District Engineer W. L. Fahey, was published in the January-February, 1952, issue of *California Highways and Public Works*, the five-mile diagonal from Lakewood Boulevard to Norwalk was listed for future construction. Since that time much has been accomplished on this very important link of the Santa Ana Freeway.

The 1952-1953 Fiscal Year Budget, as approved by the California Highway Commission on October 18, 1951, included an item in an amount of $3,381,000 for the construction of a portion of the Santa Ana Freeway between Lakewood Boulevard and Firestone Boulevard near Rosecrans Avenue. The portion proposed for construction with 1952-1953 Fiscal Year funds was from Lakewood Boulevard to Pioneer Boulevard, with the remaining portion from Pioneer Boulevard to Firestone Boulevard to follow in the 1953-1954 Fiscal Year.

Additional Funds Voted

Late in the summer of 1952 when the availability of 1952-1953 Fiscal Year funds became more definitely determined, the Highway Commission decided to expedite the completion of this important section of freeway and made the necessary funds available. On September 16, 1952, additional funds in an amount of $2,500,000 were voted to the original item, thus providing a total of $5,881,000 to complete the Norwalk Diagonal from Lakewood Boulevard to Firestone Boulevard with 1952-1953 Fiscal Year funds.

There are three construction contracts now under way. The first unit covers the portion 1.9 miles long between Lakewood Boulevard and Orr and Day Road. Within those limits a contract is also under way covering the construction of the new bridge over the San Gabriel River. The one mile unit between Orr and Day Road and Pioneer Boulevard, including a railroad grade separation structure at the location of the future Southern Pacific Railroad, has been awarded.

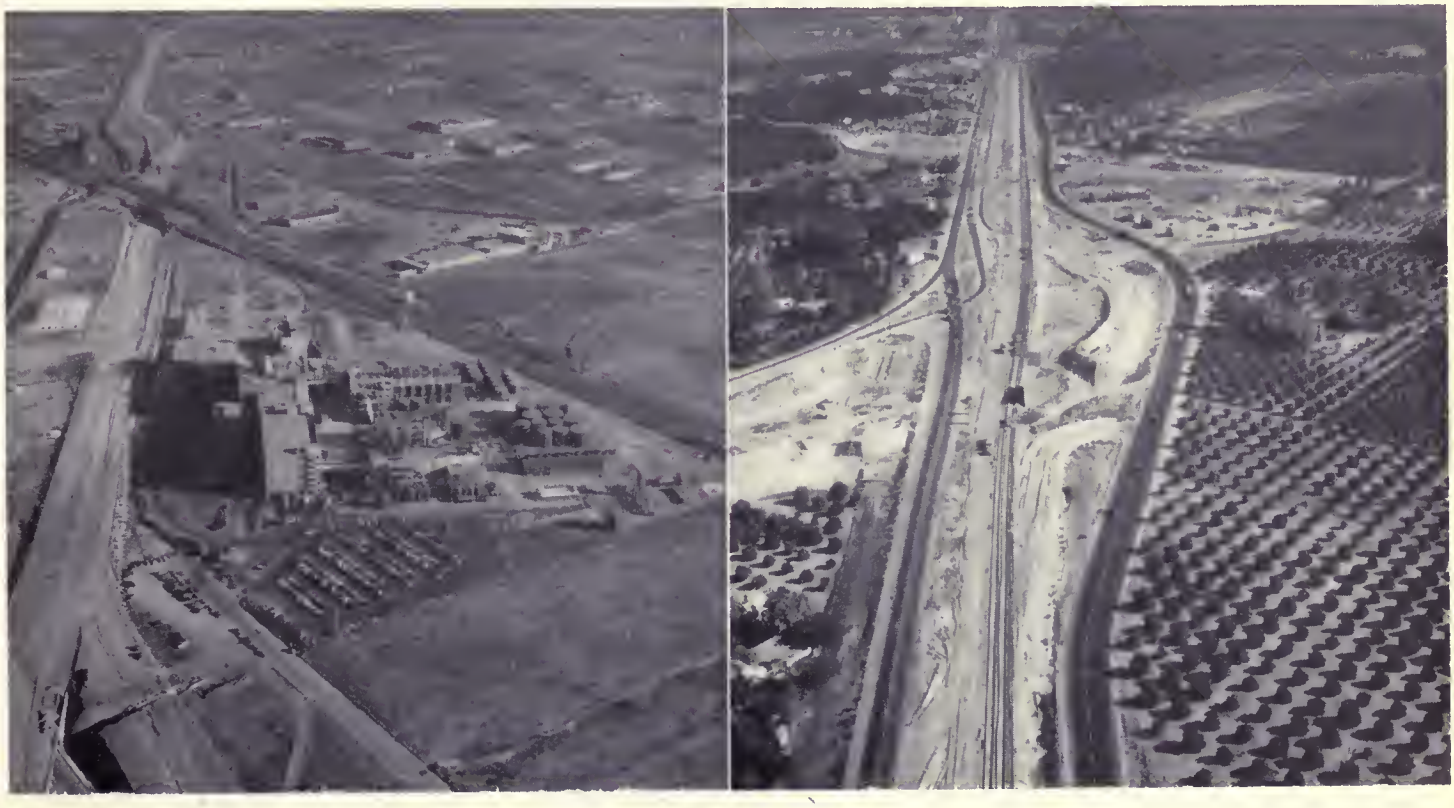
Looking westerly along section of Santa Ana Freeway approaching Los Angeles Civic Center. Grading operations shown are for Alameda Street Overcrossing.

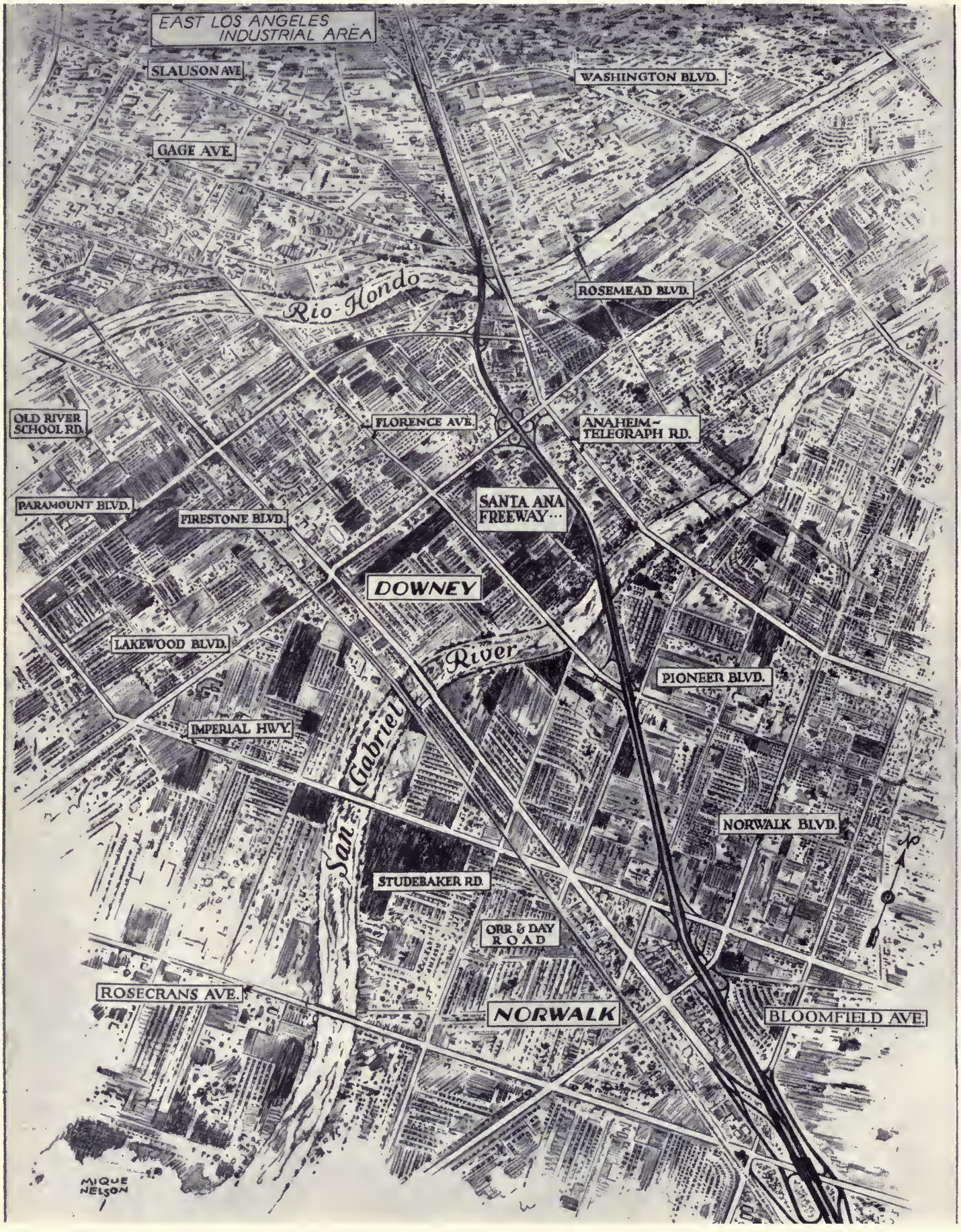




LEFT—Looking southeasterly along Santa Ana Freeway, shawing 17th Street Overcrassing in City af Santa Ana. RIGHT—Looking southeasterly alang freeway, showing canstructian in pragress an averhead bridge fram Main Street, Santa Ana.

LEFT—In left faregraund Washington Boulevard Undercrossing and in left background grade separatian with Santa Fe Raitraad. RIGHT—Constructian at intersectian with Los Angeles Avenue at Miraflares between Anaheim and Santa Ana.




EAST LOS ANGELES INDUSTRIAL AREA
SLAUSON AVE.
GAGE AVE.
WASHINGTON BLVD.
ROSEMEAD BLVD.
Rio Hondo
OLD RIVER SCHOOL RD.
FLORENCE AVE.
ANAHEIM–TELEGRAPH RD.
PARAMOUNT BLVD.
FIRESTONE BLVD.
SANTA ANA FREEWAY
DOWNEY
LAKEWOOD BLVD.
River
PIONEER BLVD.
IMPERIAL HWY.
San Gabriel
NORWALK BLVD.
STUDEBAKER RD.
ORR & DAY ROAD
ROSECRANS AVE.
NORWALK
BLOOMFIELD AVE.
MIQUE NELSON



UPPER—Looking northwesterly along "Norwalk Diagonal" section of Santa Ana Freeway which will follow just to right of line of electric power poles. The channelized and signalized intersection in foreground of Firestone Boulevard with Rosecrans Avenue will be replaced, creating grade separation and traffic interchange system as indicated in lower right hand corner of perspective drawing on opposite page. LOWER—Grading operations on "Norwalk Diagonal" northwesterly from crossing with San Gabriel River.

Several Crossings Provided

Subsequent to the execution of the freeway agreement for this portion of the Santa Ana Freeway, additional facilities have been provided. A pedestrian crossing is being constructed across the freeway at Buhman Avenue to facilitate the movement of children across the freeway between the area north of the freeway and the school which is to be constructed by the Gallatin School District. A grade

separation will be provided at Pioneer Boulevard. Pedestrian crossing is provided at Silverbow Avenue in Norwalk for the use of school children attending the Thomas Moffit School.

This unit of the freeway crosses several important county roads; namely, Orr and Day Road, Florence Avenue, Pioneer Boulevard, Imperial Highway, and Rosecrans Avenue. Grade separations and connections are to be provided at each of these roads except Orr and Day Road, which will have connections without a grade separation. Traffic on Orr and Day Road will cross the freeway via frontage road between Orr and Day Road and Florence Avenue.

Since this unit has been placed under design, the area bounded by the San Gabriel River, Orr and Day Road, and Firestone Boulevard has been for the most part completely subdivided. It is anticipated that the area between Florence Avenue and Pioneer Boulevard will shortly be subdivided. Thus the area to be traversed by the Santa Ana Freeway between Los Angeles and Norwalk will, within a short time, be wholly urban.

Serious Drainage Problem

By reason of the rapid change in land use of this area from agricultural to residential property, a serious drainage problem has arisen. This urbanization has a tendency to concentrate a large amount of water in the Norwalk area. It is hoped that this condition may be ameliorated by the construction of a storm drain system which is included among the projects covered by the projected $179,000,000 Los Angeles County bond issue that was approved by the voters in the recent general election. The proposed storm drain which will relieve the drainage of the Norwalk area is estimated to cost $5,000,000. The drainage system provided for the freeway is based upon passing the water in a generally southerly direction at intervals of 200 to 300 feet which is to simulate the natural surface flow now existing and avoiding undue concentration. However, east of Pioneer Boulevard a large concentration of water will pass under Imperial Highway and the freeway, which will be picked up by the storm drain to be constructed under the bond issue.



Looking southeasterly along Santa Ana Freeway, showing start of construction on bridge over San Gabriel River

Freeway Design

The Santa Ana Freeway from Eastman Avenue to Lakewood Boulevard is under construction as a six-lane freeway. The freeway southeasterly from Lakewood Boulevard to Norwalk will be constructed as a four-lane freeway, with provision being made for an ultimate six-lane freeway. The freeway roadways will consist of Portland cement concrete pavement with plant-mixed surfacing shoulders. Ramp con-



Looking northwesterly along freeway, showing crossing with Lakewood Boulevard in center. Rio Hondo in background.

nections will be constructed of plant mix surfacing. It is expected that the construction of the last unit of the Norwalk Diagonal, between Pioneer Boulevard and Rosecrans Avenue, will be advertised for bids to be received in December, 1952.

In connection with the various county roads, we have cooperated with Los Angeles County Road Commissioner Sam Kennedy, to obtain designs which will be mutually satisfactory to Los Angeles County and the State. The State and the Southern Pacific Railroad Company have participated in the joint financing of the railroad grade separation of this railroad's Puente branch which will cross the Santa Ana Freeway easterly of Orr and Day Road.

Railroad Company Plans

The Southern Pacific Railroad Company intends to operate several trains daily over this route, which will bypass the more congested areas traversed by the existing railroad routes in reaching Los Angeles Harbor and the Santa Ana area. The extension of this portion of the Southern Pacific Railroad System may be the forerunner of development of much of this area along industrial lines.

Those projects now under construction have been awarded to United Concrete Pipe Corporation and its successor, Ukropina, Polich and Kral. It is anticipated that the Norwalk Diagonal unit of the Santa Ana Freeway will be completed and opened to traffic in 1954. Completion dates for the four units of construction now under contract between Eastman Avenue, near the east Los Angeles city limits, and Lakewood Boulevard were given in the prior Santa Ana Freeway story referred to above.

The Norwalk Diagonal will be of great value to the motoring public from the standpoints of economy, safety, and convenience. While the benefits are more or less obvious in a general way to the freeway user, an analysis has been made showing the accruing advantages somewhat more concretely.

Traffic Studies

Traffic studies were made of the effect which the Santa Ana Freeway would produce on existing conditions at the intersections of Lakewood Boulevard at Anaheim-Telegraph Road and at Firestone Boulevard. *Study Number 1* shows the existing traffic flow with the Santa Ana Freeway terminating just west of Lakewood Boulevard. *Study 2* depicts estimated traffic if the freeway ended at Lakewood Boulevard. *Study 3* is an estimate showing traffic when the freeway is completed to a junction with Firestone Boulevard in the vicinity of Rosecrans Avenue. Similar effects would be felt at numerous other intersections in the entire

southeastern section of Los Angeles County, but for purposes of illustration these studies will suffice.

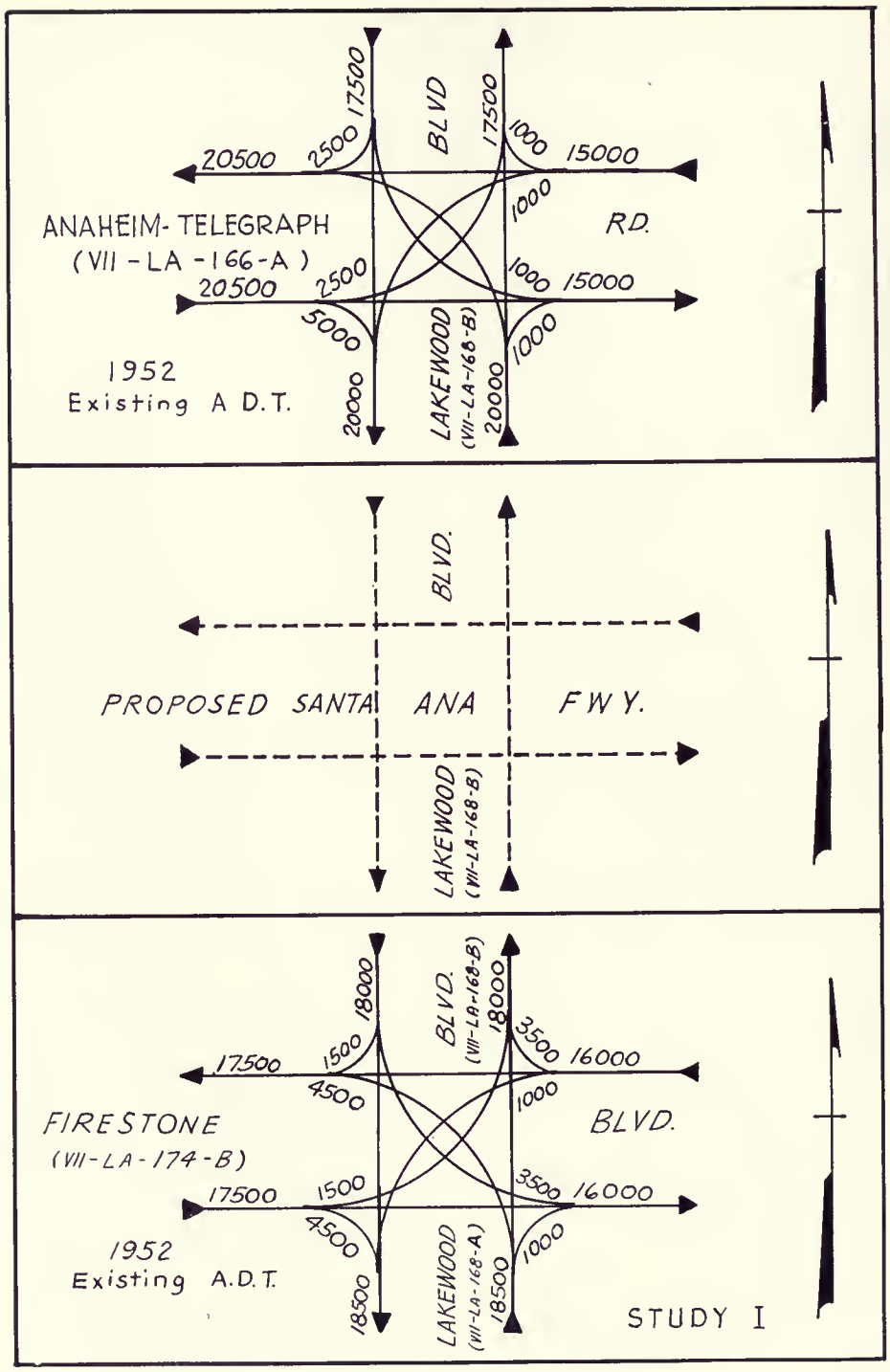
It will be noted in *Study 1* that present traffic conditions at the intersections of Anaheim-Telegraph Road and Firestone Boulevard with Lakewood Boulevard are characterized by extreme congestion and many conflicting vehicular movements of high volume. It has been necessary to install three-phase signals at both these intersections to provide an opportunity for left turning vehicles traveling in a southeasterly-northwesterly direction. This measure has afforded only partial relief to a situation which is already serious and is growing rapidly more severe as increasing traffic volumes are forced to use secondary roads serving as temporary routes for commuter traffic which will use the Santa Ana Freeway as soon as that facility is available. Meanwhile, delays to motorists at both of these intersections are an increasingly vexatious and costly matter.

Congestion Relief

Construction of the Santa Ana Freeway to a junction with Lakewood Boulevard would give considerable relief to the intersection of Anaheim-Telegraph Road and Lakewood Boulevard, but as shown in *Study 2*, conditions would continue to be extremely congested at the intersection of Firestone Boulevard, and for that portion of Lakewood Boulevard from the freeway to Firestone Boulevard.

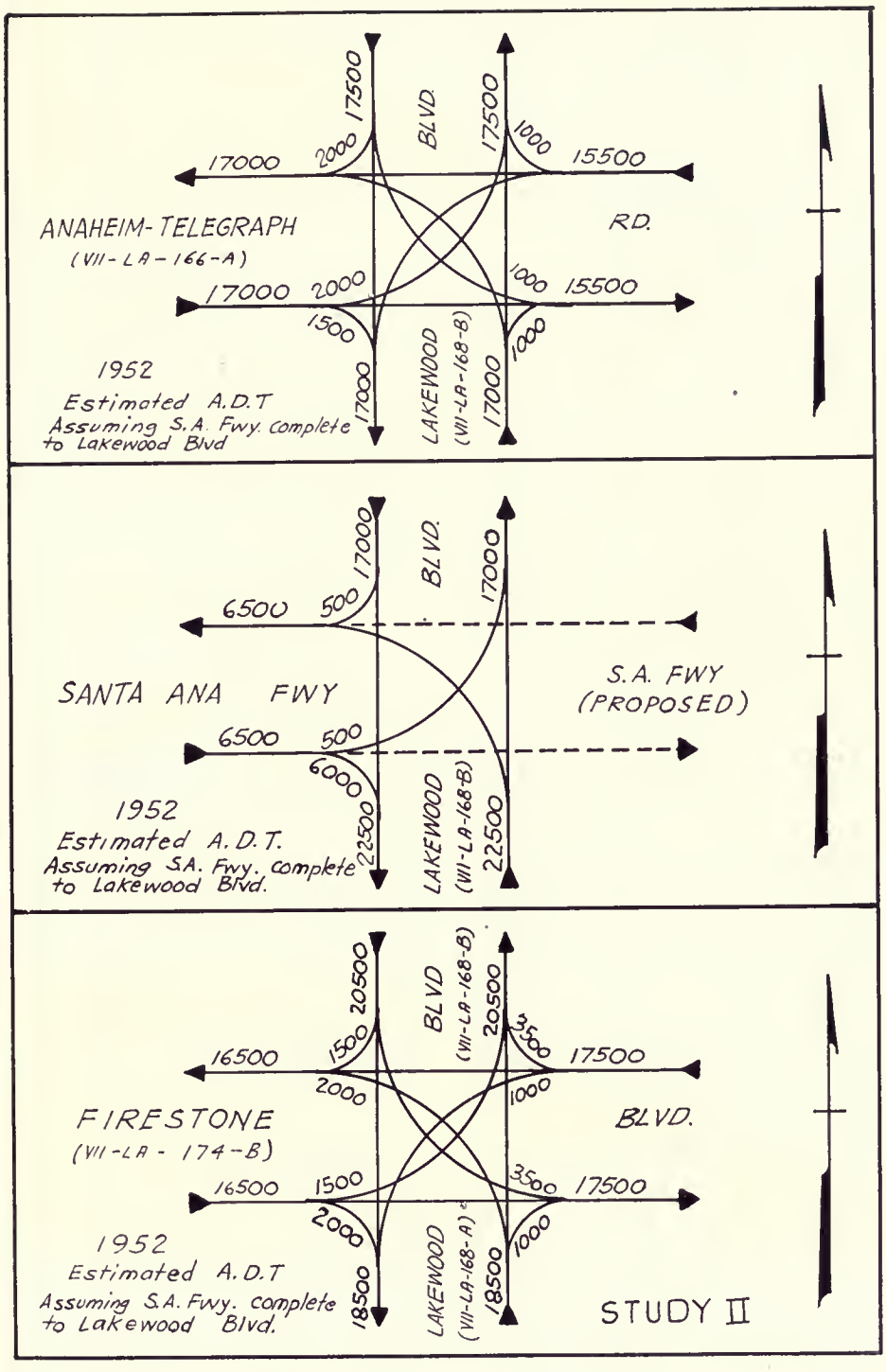
Completion of the Santa Ana Freeway to a junction with Firestone Boulevard near Rosecrans Avenue will afford relief to both intersections of Lakewood Boulevard with Anaheim-Telegraph Road and with Firestone Boulevard. The general effects following expected alteration in the traffic pattern is of a profound nature, but the outstanding benefits visible in *Study 3* are immediately apparent. Conflicting moves are reduced to a workable minimum. At the intersection of the Santa Ana Freeway and Lakewood Boulevard, the conflicting movements are carried on ramps of a grade separation and no congestion whatever is anticipated.

An evaluation of available traffic accident data shows accident frequency



to be rising at a high rate, which is symptomatic of the conditions to be expected as highway intersections become completely saturated with traffic. Experience shows that in similar instances the reduction of heavy turning movements has brought about a substantial reduction in accident frequency. Similar reductions in the huge volumes of cross traffic accentuates the tendency. No attempt has been made at this time to ascribe a monetary value to any such anticipated accident reduction.

The distance from the Lakewood Boulevard-Santa Ana Freeway intersection to Firestone Boulevard via the freeway will be approximately 5.18 miles. The distance between the iden-



tical points via Lakewood and Firestone Boulevards is 6.69 miles. Average speed along Lakewood and Firestone Boulevards with traffic signals and grade crossings at frequent intervals averages under 35 miles per hour. The average speed that can be reasonably anticipated for the freeway in this area is approximately 50 miles per hour.

Net savings in cost per day to the 26,000 estimated average daily traffic is $3,393. This is an extremely conservative estimate since a sizable proportion of the benefiting vehicles would be trucks whose proportionate savings are far greater than passenger vehicles.

. . . Continued on page 36

WASHO Road Test Now Progressing In Malad, Idaho

The Highway Research Board announced today that construction of the test road south of Malad, Idaho, has been completed and that preliminary tests under controlled truck traffic are underway. The research project, known as the WASHO Road Test, is sponsored by 11 western state highway departments, with the cooperation of the Bureau of Public Roads, the Automobile Manufacturers' Association, the Truck Trailer Manufacturers' Association, the petroleum industry and others. Administration of the project and the conduct of the research studies have been delegated to the Highway Research Board of the National Academy of Sciences, Washington, D. C., by the Western Association of State Highway Officials. The project is operated through an advisory committee established by the Highway Research Board, and made up of representatives of the contributing and cooperating agencies.

Mony Engineers Take Part

The test sections, which were built especially for the test but which will later be incorporated into a relocation of U. S. Route 191, were constructed this summer by the Carl E. Nelson Company, contractors of Logan, Utah. A large staff of Highway Research Board and Bureau of Public Roads engineers inspected every step of the construction and made thousands of tests of the soils underlying the road, the gravel base material, and the asphaltic concrete surfacing to insure uniformity of construction. Because of this rigid construction control, it should be possible to compare the behavior of different sections of the test pavement with each other with the variable of different road materials eliminated, or at least reduced to precisely known proportions. In this way it will be possible to compare the relative effects of different truck loads on different thicknesses of road materials.

Nation-wide Program

The WASHO Road Test is part of a nation-wide attempt by highway engi-

. . . Continued on page 43

Left Turns

Their Elimination Greatly Reduces Collisions in Rodeo

THE BEFORE AND AFTER accident diagrams here pictured show the very favorable results obtained by eliminating left turns at the Willow Road intersection in Rodeo on U. S. 40 in Contra Costa County.

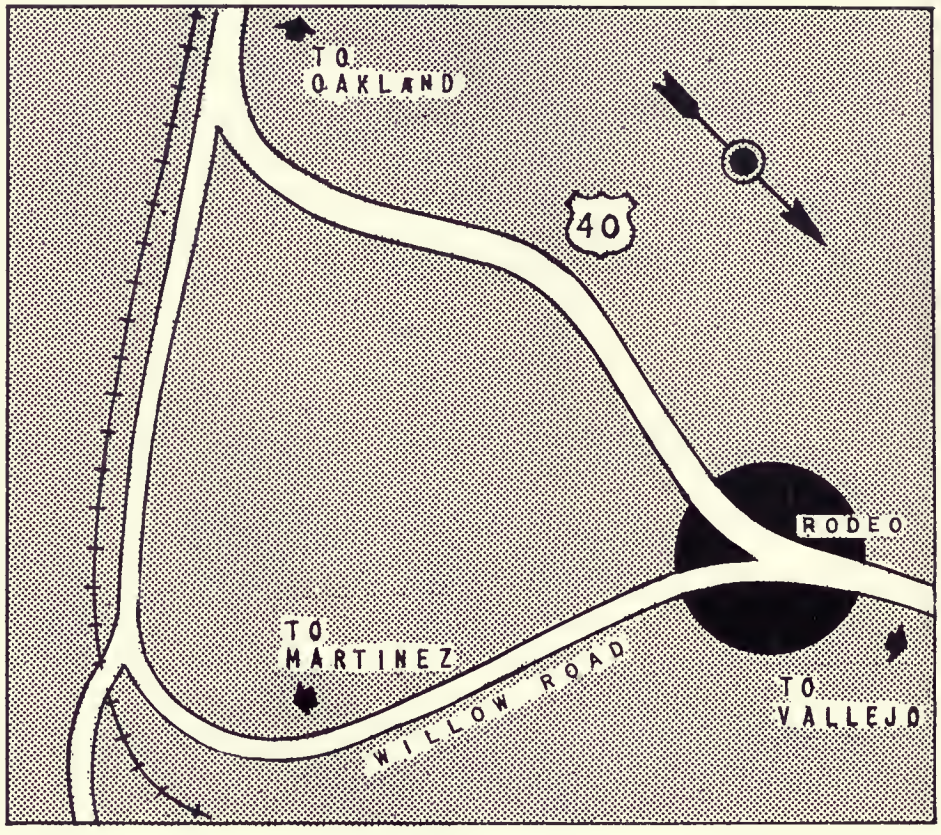
Collisions, including four- and five-car pile-ups, averaged one per week at this intersection prior to the left turn prohibition. Since installation of the oversized, illuminated sign informing motorists of this restriction, accidents have been reduced to an average of one each two months.

The important feature of this corrective measure was the excellent cooperation received from the officials of Contra Costa County. The left turn ban required their approval since Willow Road is under county jurisdiction.

Most unusual is the fact that eastbound motorists are required to travel more than a mile in order to make their left turn at the signalized Hercules intersection.

This latter intersection has been remodeled to provide additional storage for the heavier left-turn movement.

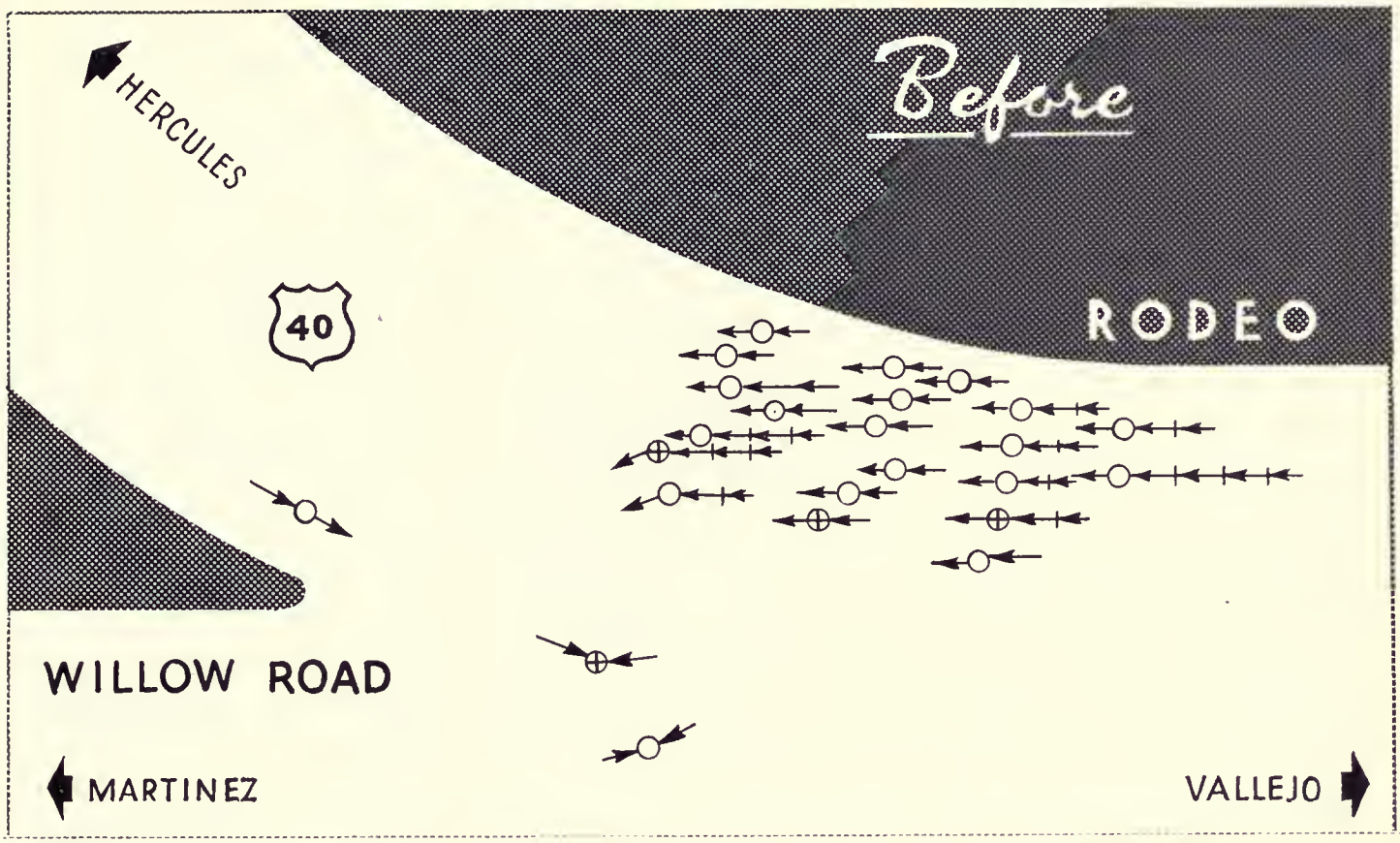
That these design changes were effective is attested by a reduced accident rate at the Hercules intersection after January 18, 1952, in spite of a heavy increase in eastbound left turns.



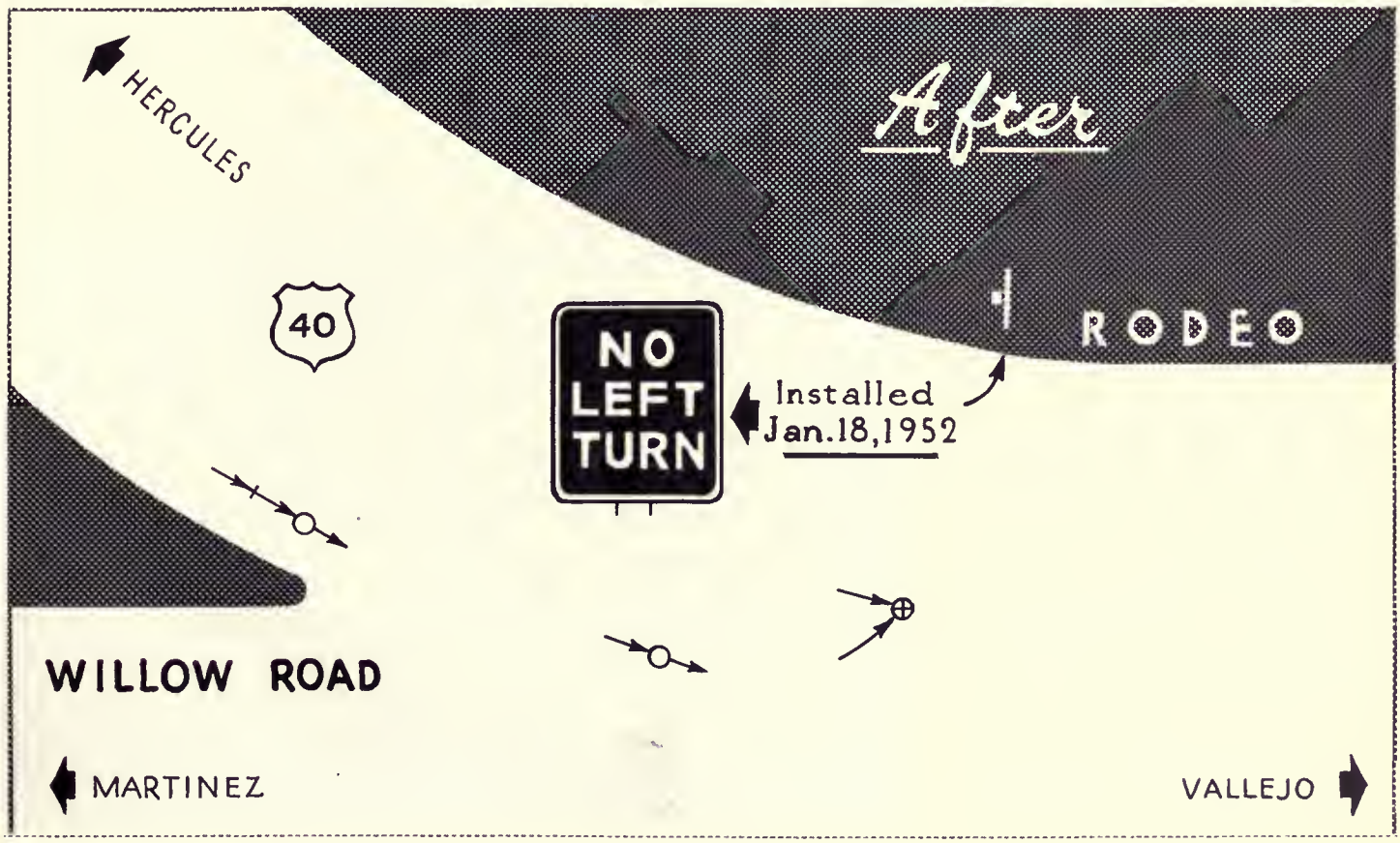
The motorists and general public are apparently well satisfied that the elimination of congestion and an 8 to 1 reduction in accidents at the Willow Road intersection is adequate compensation for the increased travel.

Looking southerly on US 40 south of Rodeo with Willow Road slanting off to the left. The steady stream of traffic coming down the hill is what a southbound motorist formerly had to cross before entering Willow Road.





These accident diagrams are for six months before January 18, 1952, and six months after January 18, 1952. Each arrow represents a vehicle and its direction of travel. Each open circle is a property damage accident; crossed circle, an injury accident.



Lab Tests

Effect of Delay in Applying Membrane Cure to Concrete

By BAILEY TREMPER, Supervising Materials and Research Engineer

THE NEED of curing concrete is so well known that it would be pointless to again enumerate the advantages that accrue from the retention of moisture during the early stages of the hardening process. Little has been reported, however, on the effect of delay in applying the curing treatment during the first several hours after the concrete is mixed and placed.

This paper gives the results of pilot tests to show the effect of withholding curing treatment under conditions that favor the rapid loss of contained moisture due to evaporation from the exposed surface of the concrete. The paper deals mainly with curing by means of concrete curing compounds, or so-called impervious membranes, a method that is employed extensively. It does not purport to cover all conceivable mixtures, construction practices or weather conditions. Nevertheless the findings point to a principle that does not receive sufficient recognition in practice.

Preliminary tests had demonstrated that a distinct difference in appearance resulted in the formed surfaces of specimens that were sealed very soon after they were cast compared to those to which the seal was not applied until after several hours had elapsed. Following this observation, the additional tests reported herein were made.

Effect on Strength

The curve, *Figure 1*, shows the principal results with respect to the strength of the concrete. It illustrates the value of applying membrane cure at the proper time after concrete is mixed and placed. It is the result of three series of test specimens that were coated with curing compounds at intervals of from one to ten hours after specimens of fresh concrete were molded. The strength of control specimens that were cured with a water-saturated blanket continuously from the time of casting is given a rating of 100 percent. Other values are relative to this base. When no curing of any kind was applied the relative strength dropped to 71 percent.

The curve shows that evaporation of water is beneficial during the period that the concrete is plastic and is bleeding due to the settlement of the solid particles. This process continues under the conditions of the tests for about three hours. At the conclusion of this period, if further loss of water is not prevented the resulting strength of the concrete is seriously impaired. If the curing treatment is not applied before about seven hours its value is largely lost. Loss of strength due to applying the curing compound too early, as at one and two hours, may be due in part to a faulty membrane on a surface that is too wet. This, however, is not the complete answer, for reasons discussed below.

Same Trend Found

In one group, not indicated in *Figure 1*, the same trend was found when the specimens were tightly sealed with metal lids and tape. When sealed with metal immediately the strength was the same, 100 percent, as obtained with a cotton mat applied immediately and kept wet continuously. The strength increased with delay in applying the metal seal up to three or four hours. If sealing was delayed beyond four hours the strength fell off but always remained at a higher level than resulted from comparable membrane cure. It is indicated, therefore, that the trend of the curve of *Figure 1* is general in its application to curing by methods other than that by membrane.

These results were obtained with specimens six inches in diameter and six inches high, cast in metal cans with soldered bottoms. The molds were surrounded with sand as shown in accompanying photo. They were exposed outdoors, away from shade during the summer, adjacent to the laboratory at Sacramento. The weather was clear, relative humidity was low and afternoon temperatures reached 90 degrees to 100 degrees. It was thus typical of rather severe, but not extreme, conditions with respect to rate of evaporation. The temperature of the sand surrounding the test specimens was 65 degrees in the morning at the start of one series and rose to 100 degrees seven hours later.

After 10 days exposure the specimens were removed from the molds, placed in water for two days and then tested for compressive strength. Saturation in water was necessary to bring the specimens to comparable moisture contents before testing for strength but it undoubtedly raised the relative rating of the poorly cured concrete.

Two series, each containing 24 specimens, were run. In the first series, 20 cylinders were cured with gray pigmented curing compound, two each at hourly intervals up to 10 hours; two specimens were covered immediately with cotton mats which were kept damp continuously and two received no curing treatment whatever. Half of the specimens were tested for compressive strength; the others were sawed longitudinally for observation. In the second series, seven cylinders were cured with gray pigmented curing compound, seven with white pigmented curing compound and seven with metal lids; one each by each method at hourly intervals up to seven hours. Of the remaining three specimens, one was sealed immediately with a metal lid, one was covered immediately with a damp cotton mat and one received no curing treatment.

Test Mixture

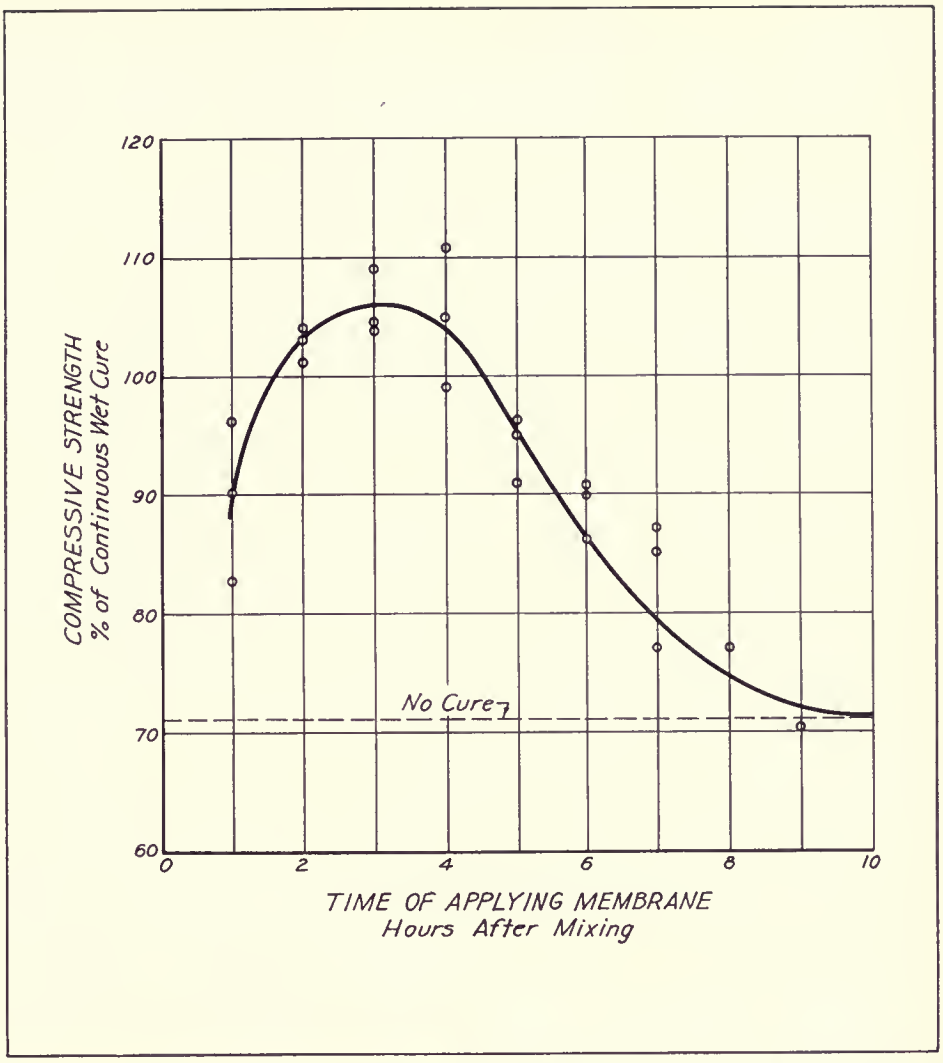
In the first series the concrete contained five sacks of cement per cubic yard, one-inch maximum size of aggregate and water to give a 3½-inch slump. In the second series, six-sack concrete was used with one-inch maxi-

mum aggregate and water to give a 3½-inch slump.

The plotted points in *Figure 1* represent relative strengths of individual specimens. Results with the gray curing compound were slightly higher than the white, but the data are not sufficiently comprehensive to warrant a distinction based solely on tint.

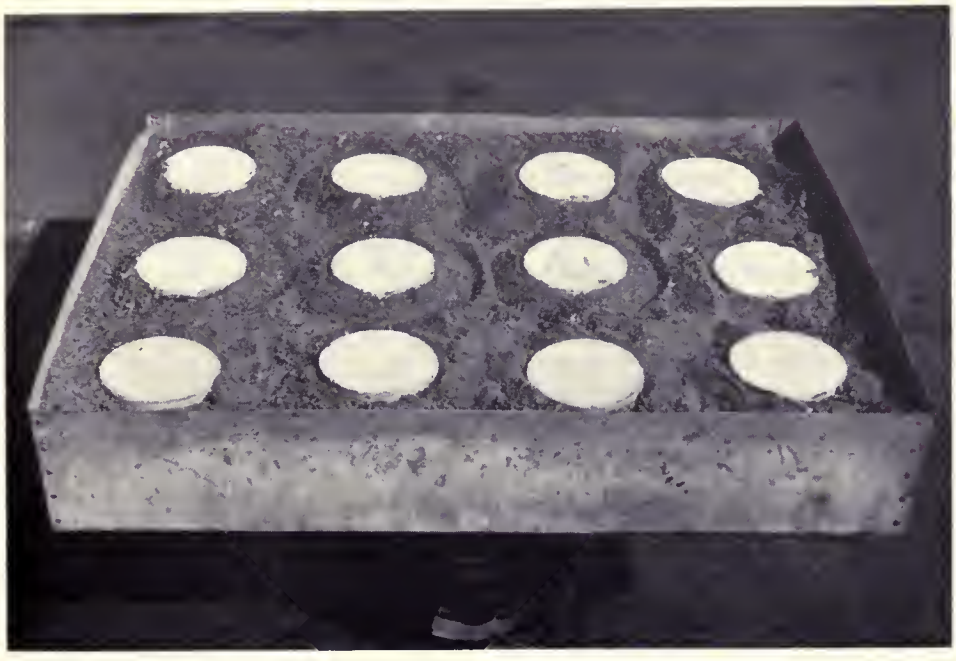
The cylinders that were sawed longitudinally were studied with a low power binocular microscope. As curing was delayed the concrete was seen to be increasingly chalky in appearance and the fine mortar increasingly weaker as revealed by a tendency for it to be torn away from the coarser sand grains by the process of sawing. Poor curing was also evident on the side and bottom of the specimens when they were removed from the molds. They became increasingly rough-textured as curing was delayed.

The optimum time of applying the curing medium probably varies, within limits that are not too wide, according to the materials used, the consistency of the concrete, the depth of the section and the availability of external moisture. Replacement moisture can reach the concrete through surfaces other than that exposed to view, for example, through the bottom of a slab laid directly on a moist subgrade. The tests reported here are believed to represent slabs such as a bridge deck where



UPPER—Strength is highest when curing is started at optimum time.

LOWER—Tests were conducted to simulate a large area of concrete.



there is no contact with the subgrade. Probably they also represent pavement slabs laid on a cement-treated subgrade that has been sealed with asphalt.

Although emphasis has been placed on the effect on compressive strength there are many reasons to believe that the adverse effects of poor curing practice extend to other important properties of concrete also.

Regardless of what may appear to be mitigating circumstances, it is a good rule to follow that intentional curing should start immediately after the water sheen has disappeared from the surface. If a membrane is to be used and if it is not applied promptly the surface should be kept continuously moist by some effective means. Covering with saturated burlap or blankets or frequent sprinkling with water would constitute effective means.

Next Budget

Highway Commission Allocates $169,970,000 for 1953-54 Fiscal Year

With $76,114,000 allocated for major construction projects (exclusive of right of way) the California Highway Commission on October 22d adopted a state highway budget of $169,970,000 for the fiscal year from July 1, 1953, to June 30, 1954.

The 1952-53 Budget allocated $72,093,000 for major construction out of a total of $155,711,651.

Included in the State Highway Budget are the following items:

Budget Items

Major construction projects, $76,114,000; rights of way, $33,921,000; maintenance, $24,000,000; preliminary engineering, $10,000,000; construction engineering, $8,000,000; administration, $5,000,000; buildings and plants, $3,500,000; highway planning, $1,750,000; maintenance and insurance of the San Francisco-Oakland Bay Bridge, $1,200,000; minor improvement and betterment, $1,000,000, and a contingency reserve of $5,485,000.

Other nonstate highway functions under supervision of the commission were approved in the amounts of $23,200,000 from the gas tax fund for major city streets administered by the cities; $5,760,000 for federal aid secondary roads, the majority of which is apportioned to county roads; and $70,000 for administration of outdoor advertising.

Major Construction Projects

Some of the major projects provided for are:

Humboldt County, for grading and surfacing 2.9 miles of U. S. 101 at Arcata from Gannon Slough to 0.9 mile north of Plaza Avenue, $600,000.

Mendocino County, for grading 4.9 miles of U. S. 101 from 4 miles north of Forsythe Creek to Ridgewood Summit, $900,000.

Shasta County, for grading and structures on U. S. 99 from Boulder Creek to Project City, 4.2 miles, $750,000.

Siskiyou County, for grading, surfacing, and structures on U. S. 99 from Spring Street to north city limits of Dunsmuir, $630,00.

Butte County, for base and surface on 9.6 miles of U. S. 99E from the junction of State Route 87 to Chico Avenue, $600,000. Grading and structures are under construction from prior budgets.

Placerville Freeway

El Dorado County, for grading and structures on U. S. 50 for a length of 1.5 miles, second construction unit of the freeway through Placerville, $595,000. Also $250,000 was voted for additional right of way through Placerville.

Sacramento-Placer Counties, for grading and structures on the freeway from Ben Ali to ½ mile east of Roseville, a distance of 12.7 miles, $2,200,000.

Sacramento County, for the freeway from C Street in Sacramento to U. S. 99E near Swanston Road to connect with the North Sacramento Freeway, grading, surfacing, and structures on 2.3 miles, $1,110,000. The major structures are under construction from prior budgets.

Eastshore Freeway

Alameda County, for grading, paving, and structures on 2.1 miles of U. S. 50 from 0.25 mile easterly of Center Street to 0.10 mile easterly of Foothill Boulevard, $1,540,000.

Alameda County, for grading, paving, and structures on the Eastshore Freeway south of Ashby Avenue to El Cerrito Avenue Overhead, 3 miles, $4,600,000.

Contra Costa County, Orinda Road Interchange, grading, paving, and structures on Sign Route 24, $1,800,000.

Marin County, for grading and structures, 3.9 miles, on U. S. 101 from Manzanita to the Golden Gate Bridge, $510,000.

San Francisco, Wye viaduct and connecting ramps at intersection of Bayshore Freeway and 13th Street, $1,105,000. The major portion of the interchange is under construction from prior budgets.

Bayshore Freeway

San Francisco, grading, paving, and structures on Bayshore Freeway from Hester Avenue, ½ mile north of San Mateo County line, to Alemany Boulevard, 1.7 miles, $3,350,000.

San Mateo County, for grading and surfacing portions of Sign Route 5 at its junction with Sign Route 1, from Thornton to Edgemar Road, 2.2 miles, $950,000.

Sonoma County, for bridge across Petaluma Creek on U. S. 101, $900,000.

Monterey County, for reconstruction of U. S. 101 from San Lucas to 2.5 miles north, $190,000.

Monterey County, for grading and structures on U. S. 101 from John Street to East Market Street in Salinas, $635,000. This is the second construction unit on the Salinas Bypass.

Paso Robles Project

Monterey County, for grading and surfacing 1.2 miles of State Route 117 from El Estero to Del Monte Junction, 1.2 miles, $400,000.

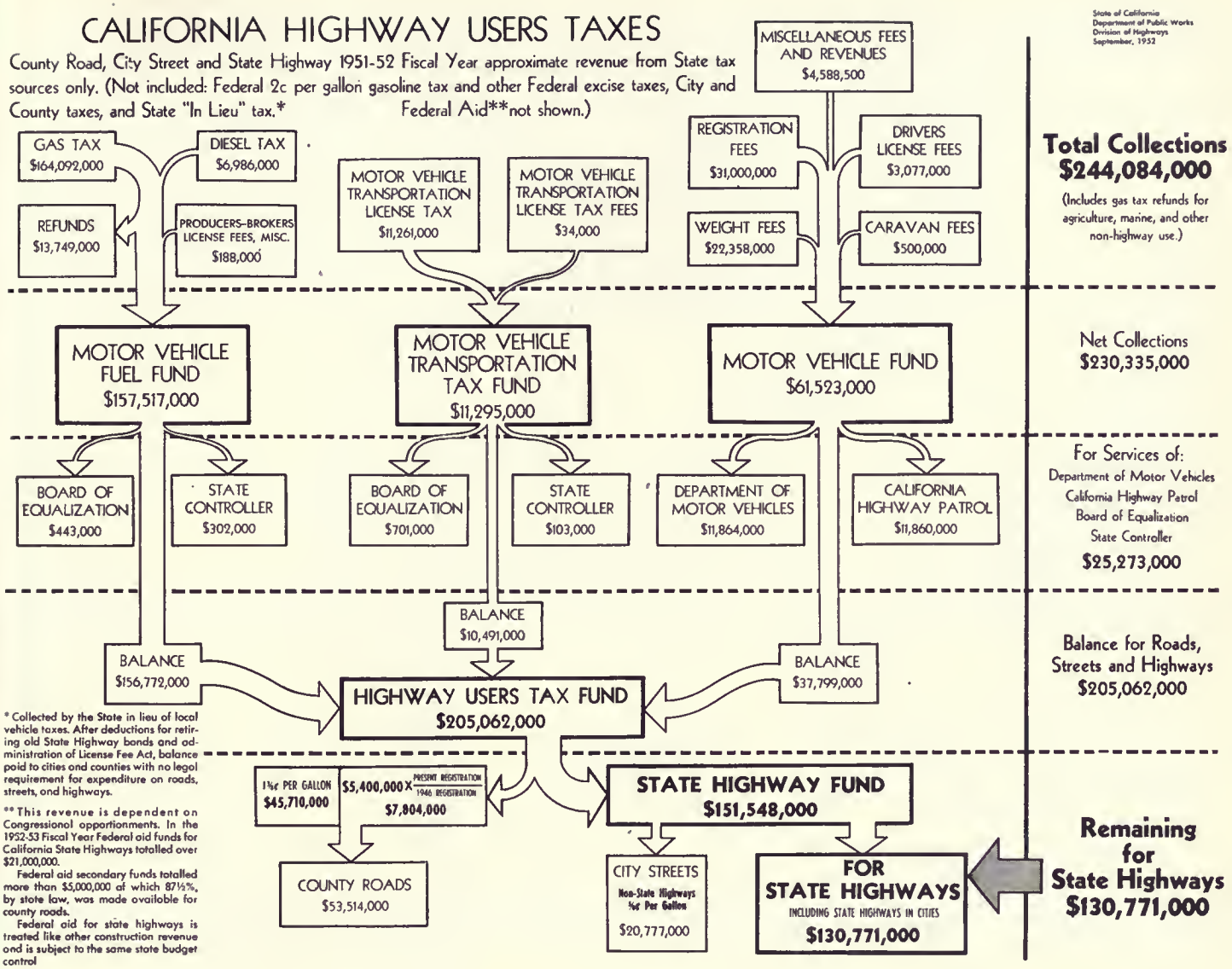
San Benito County, for a bridge and approaches across San Benito River on State Route 22, $470,000.

San Luis Obispo County, for grading and structures on U. S. 101 for a freeway between Paso Robles and San Miguel, 6.4 miles, $940,000.

Santa Barbara County, for grading and structures for a freeway on U. S. 101 from 1 mile east of Carpinteria to ½ mile east of Arroyo Parida and Ortega Hill to Sheffield Drive, 3.7 miles, $1,270,000.

Fresno County, for grading and surfacing, and structures on Sign Route 198, Warthan Canyon, from Lone Pine Inn to 2.8 miles west of Hot Springs Canyon, 5.7 miles, $420,000.

Kings County, for grading and structures on State Route 135, from Kansas Avenue to 1 mile north of Corcoran, 7 miles, $320,000.



In San Jaaquin Valley

Madera County, for surfacing portions of Sign Route 152 from Califa to Merced county line, 8.5 miles, $390,000.

Kern County, for a bridge and approaches across Kern River at Bakersfield on U. S. 99, $655,000.

Kern County, for surfacing 7.2 miles of U. S. 399 from Weedpatch to Arvin, $280,000.

Tulare County, for grading and structure for Visalia Airport interchange on U. S. 99, $900,000.

Los Angeles County, grading, paving, and structures on Santa Ana Freeway-Ramona Freeway connection, $1,335,000.

Los Angeles Freeways

Los Angeles County, for grading, paving, and structures on U. S. 99 from 0.6 mile south of junction of Sepulveda Boulevard to 0.4 mile north of the north city limits of Los Angeles at Newhall Junction, 2.8 miles, $3,140,000.

Los Angeles County, grading, paving, and structures on Ramona Freeway-San Dimas Road to San Bernardino county line, 6.2 miles, $4,100,000.

Los Angeles, for grading, paving, and structures on portions of Harbor Freeway-Olympic Boulevard to Flower Street, 1.2 miles, $3,160,000.

Los Angeles County, for structures on Los Angeles River Freeway-north junction Atlantic Boulevard to Santa Ana Freeway, $2,740,000.

Los Angeles County, grading, surfacing, and widening structures on Redondo Beach Boulevard and 174th Street, Inglewood Avenue to Normandie Avenue, 3.7 miles, $890,000.

Orange County, grading, paving, and structures on U. S. 101 from First Street to Red Hill Avenue in Tustin, 1.8 miles, $1,610,000.

In Orange and Ventura

Orange County, for bridge and approaches across Santa Ana River on State Route 175, $900,000.

Ventura County, for grading, paving, and structures on U. S. 101 between Calleguas Road to Central Ave-

CALIFORNIA'S HIGHWAYS and "buy" ways

1 SOURCE

Highway User Taxes Provide Highway Improvements



67% 12½% 11½% 4% 4% 1%

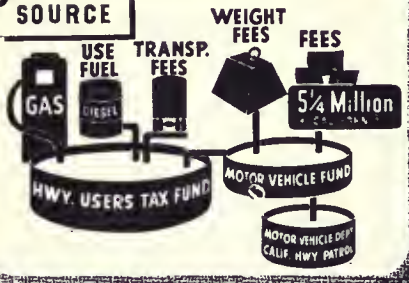
2 SOURCE

6½¢ GAS TAX

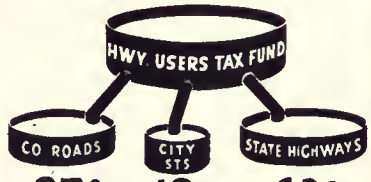


2¢ FEDERAL USE
1⅜¢ COUNTY ROADS
⅝¢ CITY STREETS
2½¢ STATE HIGHWAYS

3 SOURCE

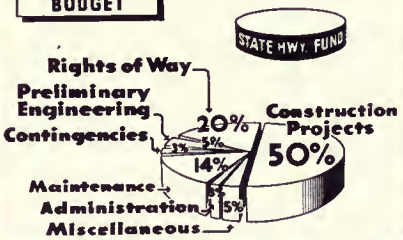


4 DISTRIBUTION



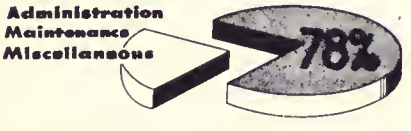
27% 10% 63%

5 STATE HIGHWAY BUDGET



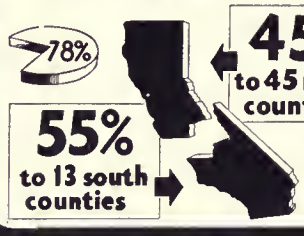
6 CONSTRUCTION FUNDS

State Highway Budget



78% For new Construction

7 first FUNDS ARE DIVIDED NORTH AND SOUTH

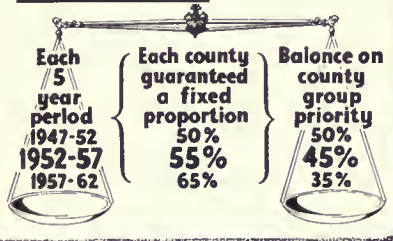


8 second CONSTRUCTION FUNDS - ALLOCATIONS -

55% for state highway deficiencies on basis of percentage fixed by law for each county

Balance on basis of greatest need and continuity of highway planning 45%

9 the LAW PROVIDES:



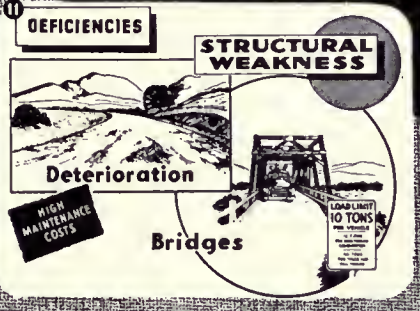
how CALIFORNIA STATE HIGHWAYS ARE FINANCED

Of the 14,000 mile California State Highway system *more than 11,000 miles are deficient* in some respect.....affecting safe traffic capacity

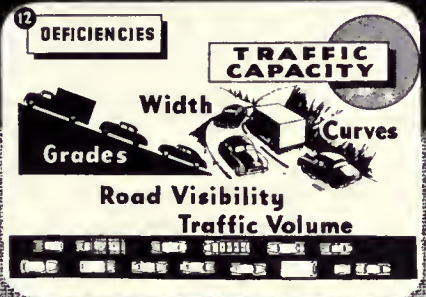
10 PRIORITY OF NEEDS

DEFICIENCY	PRIORITY Road 1	Road 2	Road 3
Structural Condition		✓	✓
Critical Bridges	✓		✓
Alignment-Grades			✓
Traffic Volume		✓	✓
Width		✓	✓
Accident Record	✓	✓	✓
Obstructions	✓	✓	✓

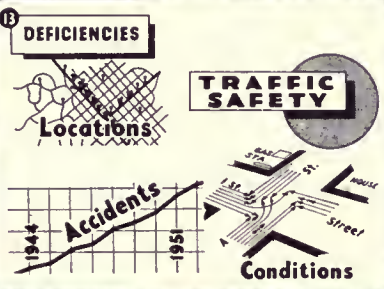
11 DEFICIENCIES



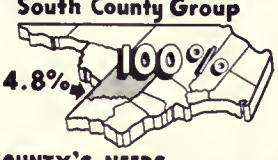
12 DEFICIENCIES



13 DEFICIENCIES

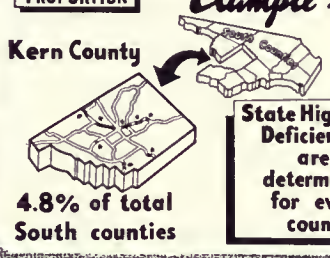


14 COUNTY PROPORTION *Example:*



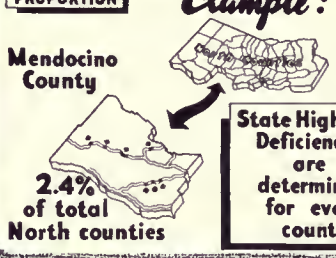
$$\frac{\text{1 COUNTY'S NEEDS}}{\text{TOTAL GROUP NEEDS}} = \%\ \text{Share}$$

15 COUNTY PROPORTION *Example:*



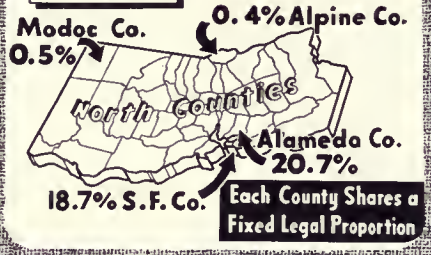
State Highway Deficiencies are determined for every county

16 COUNTY PROPORTION *Example:*



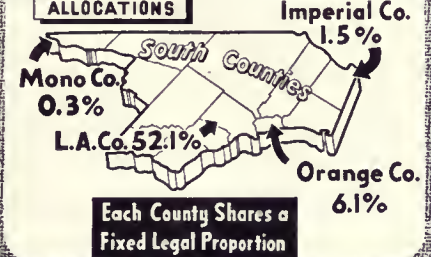
State Highway Deficiencies are determined for every county

17 COUNTY ALLOCATIONS



Each County Shares a Fixed Legal Proportion

18 COUNTY ALLOCATIONS



Each County Shares a Fixed Legal Proportion

1951 CALIFORNIA VITAL HIGHWAY STATISTICS

Population	Nearly 11 million
Vehicle Registration	Nearly 5½ million
State Highway Mileage	13,986
Vehicle Miles Traveled—Rural State Highway System	14 billion annually
Vehicle Miles Traveled—Full Freeways	710 million annually
Accident Rate—Rural State Highways	2.71 per million vehicle miles
Accident Rate—Full Freeways	1.51 per million vehicle miles
Fatality Rate—Rural State Highways	11.39 per 100 million vehicle miles
Fatality Rate—Full Freeways	2.54 per 100 million vehicle miles

FACTS ON FULL FREEWAYS

(From Records on 50 Miles in Operation, 1951)

Traffic volume 13 times that of average rural state highway.

Accident rate only about one-half and fatality rate only about one-fifth that of conventional highways.

Freeways are costly; but in terms of lives saved, congestion relieved and economy of vehicle operation they represent the best practical remedy yet devised for our major highway deficiencies.

Major Construction Projects in State Highway B

nue in Camarillo, 5.7 miles, $1,395,000. A grade separation is under construction from a prior budget.

Riverside County, for grading and surfacing 4.8 miles on U. S. 395 from Nuevo Road to March Air Force Base, $465,000.

Inyo County, for grading and surfacing 8.6 miles of U. S. 395 from Dunmovin to Haiwee, $200,000.

Merced County, for grading and surfacing 3.6 miles of U. S. 99 from Livingston to south of Delhi, $500,000. A bridge across the Merced River is under construction from a prior budget.

San Joaquin County, for grading and surfacing and structures on U. S. 99 from one mile north of Ripon to Austin Road, 3.4 miles, $1,385,000.

In Far South

Imperial County, for grading and paving 2.4 miles on U. S. 80 from the El Centro east city limits to 0.3 mile east of Route 201, $400,000.

San Diego County, grading, paving, and structures on U. S. 101 for the freeway from Palm City to Mexican border, 3.8 miles, $1,225,000.

San Diego County, grading and paving portions of State Route 196 from Oceanside to Vista, 6.7 miles, $750,000.

Los Angeles County, grading, paving, and structures on U. S. 99 from Los Angeles county line to Archibald Avenue in Upland and Ontario, 7.2 miles, $3,200,000.

Right of Way Allocations

Included in right of way allocations for the next fiscal year are: Eastshore Freeway in Oakland from Broadway to Bay Bridge distribution structure, $1,000,000, and Route 228 from Foothill Boulevard to Eastshore Freeway, $1,000,000, both in Alameda County; San Francisco, Embarcadero Freeway from Lombard and Van Ness to San Francisco-Oakland Bay Bridge, $1,750,000; for Los Angeles County, Santa Ana and Hollywood Freeways from Ramona Freeway to Barham Boulevard, portions, $600,000; Los Angeles County, U. S. 101 from Sepulveda Freeway to Calabasas, $1,000,000; Los Angeles County, Ramona Freeway from Rosemead Boulevard to San Gabriel River Bridge through El Monte, $2,500,000; Los Angeles County, Ramona Freeway from San Gabriel River to San Bernardino county line, $900,000; Los Angeles County, Harbor and Arroyo Seco Freeways from Adobe Street to Gage Avenue, portions, $4,900,000; Los Angeles, Los Angeles River Freeway from U. S. 101 Alt. to Santa Ana Freeway, $2,650,000; Riverside County, Sign Route 18 from Arlington Avenue to Russell Street in Riverside, $1,000,000.

County	Route	Description	Approximate mileage	Estimated cost
Alameda	5, 108 (US 50)	Vicinity of Intersection of Routes 5 and 108, east of Livermore, drainage revision	5.4	$115,000
Alameda	5 (US 50)	0.25 mile easterly of Center Street to 0.1 mile easterly of Foothill Boulevard, grade, pave and structures	2.1	1,540,000
Alameda	69, 206 (US 40)	Eastshore Freeway South of Ashby Avenue to El Cerrito Overhead, in Emeryville, Berkeley and Albany, grade, pave and structures	3.0	4,600,000
Alameda-Contra Costa	69	Albany Drain and Stege Drain, in Albany and Richmond, bridges		75,000
Alameda	105	0.4 mile westerly of Hesperian Boulevard to 0.3 mile northerly of Harder Road, grade and surface	1.5	350,000
Alameda	227	Mountain Boulevard, Route 75 near Lake Temescal to Route 5 in Oakland, grade and surface (Joint Highway District No. 26)		300,000
Alameda	Various	Rights of way on state highway routes		2,652,000
Alpine	23	Mono county line to Junction Route 24, grade and surface	10.3	352,000
Amador	Various	Rights of way on state highway routes		22,000
Butte	3 (US 99E)	Junction Route 87 to Chico Avenue, base and surface	9.6	600,000
Butte	21, 87 (SR 24)*	Intersection Routes 21 and 87, channelization		40,000
Butte-Glenn	47 (SR 32)	Sacramento River, east of Hamilton City, redeck bridge		160,000
Calaveras-San Joaquin	24 (SR 12)	West of San Joaquin county line to Valley Springs (portions), grade and surface	5.5	350,000
Calaveras	Various	Rights of way on state highway routes		55,000
Contra Costa-Alameda	69	Albany Drain and Stege Drain, in Albany and Richmond, bridges		75,000
Contra Costa	59, 14 (US 40)	Jefferson Avenue to Rollingwood, in Richmond, El Cerrito, San Pablo and Hercules (portions), structures		390,000
Contra Costa	75 (SR 24)	Orinda Road Interchange, grade, pave and structures	0.8	1,800,000
Contra Costa	75 (SR 21)	One Mile south of Pacheco to Martinez grade and surface	5.1	380,000
Contra Costa	106 (SR 4)	Muir Station to Route 75, surface	3.5	300,000
Contra Costa	Various	Rights of way on state highway routes		1,375,000
Del Norte	46	0.5 mile east of Klamath to Turwar Creek, widen and surface	1.8	142,000
El Dorado	11 (US 50)	Through Placerville, grade and structures	1.5	595,000
El Dorado	Various	Rights of way on state highway routes		300,000

* SR = State Sign Route

get for 1953-54 Fiscal Year Total $76,114,000

County	Route	Description	Approximate mileage	Estimated cost
Fresno	4 (US 99)	North city limits of Kingsburg to Selma (east lane), surface	3.1	$85,000
Fresno	4 (US 99)	0.3 mile south of California Avenue to Santa Clara Street, in Fresno, grade and pave	0.8	175,000
Fresno	10 (SR 198)*	Lone Pine Inn to 2.8 miles west of Hot Springs Canyon (portions), grade, surface, and structures	6.7	420,000
Fresno	41 (SR 180)	Orange Avenue in Fresno to Maple Avenue, surface	1.0	52,000
Fresno	41 (SR 180)	Wahtoke Creek, bridge and approaches		20,000
Fresno	Various	Rights of way on state highway routes		400,000
Glenn-Butte	47 (SR 32)	Sacramento River east of Hamilton City, redeck bridge		160,000
Humboldt	1 (US 101)	Thogerson Cattlepass, cattlepass		17,000
Humboldt	1 (US 101)	Gannon Slough to 0.9 mile north of Plaza Avenue, grade and surface	2.9	600,000
Humboldt	1 (US 101)	Stephens Grove to Weott (portions), base and surface	6.0	150,000
Humboldt	35 (SR 36)	Alton to Bridgeville (portions), base, surface and drainage	6.9	80,000
Humboldt	Various	Rights of way on state highway routes		300,000
Imperial	12 (US 80)	Coyote Wells Underpass to Plaster City (portions), surface	4.7	50,000
Imperial	27 (US 80)	East city limits of El Centro to 0.3 mile east of Route 201, grade and pave	2.4	400,000
Imperial-Riverside	187 (SR 111)	One mile northwest of Frink Road to 1.2 miles northwest of Riverside county line, shoulders	12.6	75,000
Imperial	201	Junction of Route 187, 0.5 mile east of Alamorio to Calipatria (portions), surface	9.0	100,000
Imperial	Various	Rights of way on state highway routes		205,000
Inyo	23 (US 6, 395)	Dunmovin to Haiwee, grade and surface	8.6	200,000
Inyo	23 (US 6, 395)	Ash and Cottonwood Creeks, bridges		75,000
Inyo	127 (SR 190)	Rolling Hills to Darwin Junction, grade and surface	9.6	50,000
Inyo	127 (SR 190)	3.8 miles east of Stovepipe Wells to 6.3 miles east of Stovepipe Wells, grade and surface	2.5	25,000
Kern	4 (US 99, 466)	Kern River, bridge and approaches		655,000
Kern	58 (US 466)	Sand Cut to Cable (portions), surface	8.8	280,000
Kern	58 (SR 178)	Goose Lake Slough and Overflow, bridge and approaches		67,000
Kern	58 (US 466)	Replace timber cattlepasses at various locations		10,000
Kern	140	Weedpatch to Arvin, surface	7.2	280,000
Kern	143	Di Giorgio Road to Panama Road (in Lamont), grade and surface	1.0	120,000
Kern	Various	Rights of way on state highway routes		481,000
Kings	135	Kansas Avenue to one mile north of Corcoran (portions), grade and structures	7.0	320,000
Lake	49 (SR 53)	Putah Creek, bridge		220,000
Lassen	29 (SR 36)	In Susanville, curbs, gutters and surface		10,000
Los Angeles	2, 26 (US 99 101)	Santa Ana Freeway-Ramona Freeway connection in Los Angeles, grade, pave and structures		1,335,000
Los Angeles	2 (US 99, 101)	Vignes Street Separation in Los Angeles, structure		600,000
Los Angeles	4 (US 99)	Junction Route 23 to Kern county line (portions), subseal and surface	5.0	350,000
Los Angeles	4, 23, 157, 158 (US 99, 6) (SR 7)	0.6 mile south of Junction of Route 158 (Sepulveda Boulevard) to 0.4 mile north of north city limits of Los Angeles (Newhall Junction), grade, pave and structures	2.8	3,140,000
Los Angeles	9 (SR 118)	Alta Canyada Road to La Canada-Verdugo Road, grade and surface	1.9	150,000
Los Angeles	23 (US 6)	Sierra Highway from Williams Ranch to Palmdale (portions), grade and surface	4.6	450,000
Los Angeles	26 (US 60, 70, 99)	Ramona Freeway-San Dimas Road to San Bernardino county line, grade, pave and structures	6.2	4,100,000
Los Angeles	60 (US 101 Alt)	Southeasterly city limits of Santa Monica to Olympic Boulevard, grade and surface	1.3	325,000
Los Angeles	61, 62 (SR 2, 39)	Angeles Crest Highway and San Gabriel Canyon Road, Honor Camp Labor, grade		423,000
Los Angeles	165 (SR 11, US 6)	Harbor Freeway-Olympic Boulevard to Flower Street in Los Angeles (portions), grade, pave and structures	1.2±	3,160,000
Los Angeles	167 (SR 15)	Los Angeles River Freeway-North Atlantic Boulevard to Santa Ana Freeway, structures		2,740,000
Los Angeles	167	Atlantic Boulevard-Garvey Avenue in Monterey Park (Route 26) to Valley Boulevard in Alhambra (Route 77), grade and surface	0.8	160,000
Los Angeles	168 (SR 19)	Center Street to Bellflower Boulevard, grade and surface	3.3	230,000
Los Angeles	174 (SR 10)	Manchester Avenue-Osage Avenue to Freeman Boulevard, grade and surface	0.6	117,000
Los Angeles	175 (SR 14)	Redondo Beach Boulevard and 174th Street-Inglewood Avenue to Normandie Avenue, grade, surface and widen structure	3.7	890,000
Los Angeles	Various	Rights of way on state highway routes		16,386,500
Madera	32 (SR 152)	Califa to Merced county line (portions), surface	8.5	390,000
Madera	124	Junction Route 32 to south city limits of Chowchilla, surface	2.5	65,000
Madera	126 (SR 145)	Cottonwood Creek, bridge and approaches	0.4	45,000
Madera	Various	Rights of way on state highway routes		110,000
Marin	1 (US 101)	Manzanita to Golden Gate Bridge, grade and structures	3.9	510,000
Marin	52	Alto intersection to Belvedere (portions), surface and shoulders	1.5	100,000
Marin	56 (SR 1)	Tamalpais to Muir Beach (portions), retaining walls		30,000
Marin	Various	Rights of way on state highway routes		240,000
Mariposa	65 (SR 49)	Coulterville to Mariposa (portions), grade and surface	2.0	90,000
Mariposa	110 (SR 132)	Stanislaus county line to Coulterville (portions), grade and surface	7.6	25,000
Mariposa	Various	Rights of way on state highway routes		3,000
Mendocino	1 (US 101)	Four miles north of Forsythe Creek to Ridgewood Summit, grade	4.9	900,000
Mendocino	1 (US 101)	Outlet Creek to Reeves Creek, surface	4.5	280,000

* 5R = State Sign Route

County	Route	Description	Approximate mileage	Estimated cost
Mendocino	48 (SR 28)*	North Fork Navarro River, bridge and approaches		$165,000
Mendocino	70	Russian River, bridge and approaches	0.8	400,000
Mendocino	Various	Rights of way on state highway routes		1,000
Merced	4 (US 99)	O Street in Merced to Buhach Road (portions), surface	4.5	200,000
Merced	4 (US 99)	Livingston to south of Delhi, grade and surface	3.6	500,000
Merced	32 (SR 152)	Through Los Banos, grade and surface	1.1	140,000
Merced	41 (SR 33)	Main Canal, bridge and approaches	0.4	125,000
Merced	122 (SR 140)	San Joaquin River to Merced (portions), grade, surface and structures	5±	350,000
Merced	Various	Rights of way on state highway routes		160,000
Modoc	28 (US 395)	Alturas to 11 miles east, honor camp labor, grade	11.0	240,000
Modoc	28 (US 299)	Adin to Rush Creek, surface	4.2	150,000
Modoc	73 (US 395)	Junction Route 28 to state line, honor camp labor, grade and oil	33.8	120,000
Modoc	210 (SR 139)	Perez Overhead, redeck and replace abutments		50,000
Mono	23	Junction Route 95 to Alpine county line, surface	8.0	50,000
Mono	111	Silver Lake to Rush Creek Weir, grade and surface	1.9	70,000
Mono	Various	Rights of way on state highway routes		9,000
Monterey	2 (US 101)	San Lucas to 2.5 miles north, reconstruct	2.4	190,000
Monterey	2 (US 101)	John Street to East Market Street in Salinas (portions), grade and structures	0.7	635,000
Monterey	56 (SR 1)	Redeck timber bridges and replace four cattlepasses		60,000
Monterey	56 (SR 1)	Little Sur River, bridge and approaches	0.7	195,000
Monterey	56 (SR 1)	Loma Linda to Watsonville Junction, grade and surface	1.6	285,000
Monterey	117	El Estero to Del Monte Junction in Monterey, grade and surface	1.2	400,000
Napa	49 (SR 29)	Oakville to Rutherford, surface	1.8	136,000
Napa	Various	Rights of way on state highway routes		30,000
Nevada	25 (SR 49)	Route 15 to near northwest city limits of Nevada City, grade and surface	1±	70,000
Nevada	38 (US 40)	Truckee River Bridge and Hinton Overcrossing Bridge, reconstruct railing and curb		20,000
Nevada	Various	Rights of way on state highway routes		100,000
Orange	2 (US 101)	Santa Ana Freeway-First Street to Red Hill Avenue, grade, pave and structures	1.8	1,610,000
Orange	171 (SR 39)	Garfield Avenue to Smeltzer Avenue, grade, pave and structures	3.0	450,000
Orange	171 (SR 39)	Coyote Creek, bridge and approaches		75,000
Orange	175 (SR 14)	Santa Ana River, bridge and approaches		900,000
Orange	176	Imperial Highway, Route 62 (Mirada Avenue) to Route 2 (US 101), grade and surface	2.0	160,000
Orange	Various	Rights of way on state highway routes		1,357,500
Placer-Sacramento	3, 17 (US 40, 99E)	Ben Ali to ½ mile east of Roseville, grade and structures	12.7	2,200,000
Placer	Various	Rights of way on state highway routes		106,000
Plumas	21 (SR 24)	Willow Creek Bridge, construct new abutments		15,000
Plumas	83 (SR 89)	Graeagle Creek, bridge and approaches		85,000
Riverside	26 (US 60, 70, 99)	1.2 miles east of Whitewater to 2.3 miles west of Garnet, grade, surface and structures	2.2	350,000
Riverside	64 (SR 74)	Colt Creek, bridge and approaches		20,000
Riverside	64 (SR 74, 111)	In Indio, Arabia Street to 0.1 mile east of California Street, grade and surface	0.9	50,000
Riverside	64 (US 60, 70)	Desert Center to Blythe (portions), surface	14.0	150,000
Riverside	78 (US 395)	Nuevo Road to March Air Force Base, grade and surface	4.8	465,000
Riverside-Imperial	187 (SR 111)	One mile northwest of Frink Road to 1.2 miles northwest of Riverside county line, shoulders	12.5	75,000
Riverside	Various	Rights of way on state highway routes		2,031,000
Sacramento-Placer	3, 17 (US 40, 99E)	Ben Ali to one-half mile east of Roseville, grade and structures	12.7	2,200,000
Sacramento	11 (SR 24)	Antioch Bridge to 1.5 miles northerly, grade, surface and structures	1.5	800,000
Sacramento	11 (US 50)	Alder Creek, grade and structure		65,000
Sacramento	98	C Street in Sacramento to Route 3 near Swanston Road, grade, surface and structures	2.3	1,110,000
Sacramento	Various	Rights of way on state highway routes		360,000
San Benito	22 (SR 156)	San Benito River, bridge and approaches	1.0	470,000
San Bernardino	26 (US 70, 99)	Los Angeles county line to Archibald Avenue, grade, pave and structures	7.2	3,200,000
San Bernardino	26 (US 70, 99)	Through Colton, surface	1.5	40,000
San Bernardino	31 (US 91,466)	Three miles west of Halloran Springs to Nevada state line, shoulders	39.1	320,000
San Bernardino	31 (US 91, 66, 466)	Redecking various timber trestle bridges		100,000
San Bernardino	43 (SR 18)	Big Bear City to Box "S" Ranch (portions), grade and surface	3.0	10,000
San Bernardino	58 (US 466)	Hinkley railroad crossing, grade and surface	0.9	75,000
San Bernardino	58 (US 66)	Redecking various timber trestle bridges		300,000
San Bernardino	59 (SR 138)	Los Angeles county line to route 61, grade and surface	6.7	100,000
San Bernardino	59, 188 (SR 2)	West Fork Mojave River, bridges and approaches		120,000
San Bernardino	Various	Rights of way on state highway routes		401,500
San Diego	2 (US 101)	Torrey Pines Grade in San Diego, grade and pave	2.1	200,000
San Diego	2 (US 101)	Monterey Freeway-Palm City to Mexican border, grade, pave and structures	3.8	1,225,000
San Diego	12 (US 80)	College Avenue in San Diego to La Mesa Boulevard in La Mesa, grade and surface	2.5	380,000
San Diego	78 (SR 79)	Warners to the San Luis Rey River (portions), grade and pave	1.2	73,000
San Diego	196 (SR 78)	Oceanside to Vista (portions), grade and pave	6.7	750,000
San Diego	Various	Rights of way on state highway routes		1,026,000
San Francisco	2, 68 (US 40, 50, 101)	Intersection of Bayshore Freeway (Route 68) with 13th Street (Route 2), wye viaduct and connecting ramps	0.2	1,015,000
San Francisco	68 (US 101, By-pass)	Bayshore Freeway-Hester Avenue (one-half mile north of San Mateo county line) to Alemany Boulevard, grade, pave and structures	1.7	3,350,000

* 5R = 5tate Sign Route

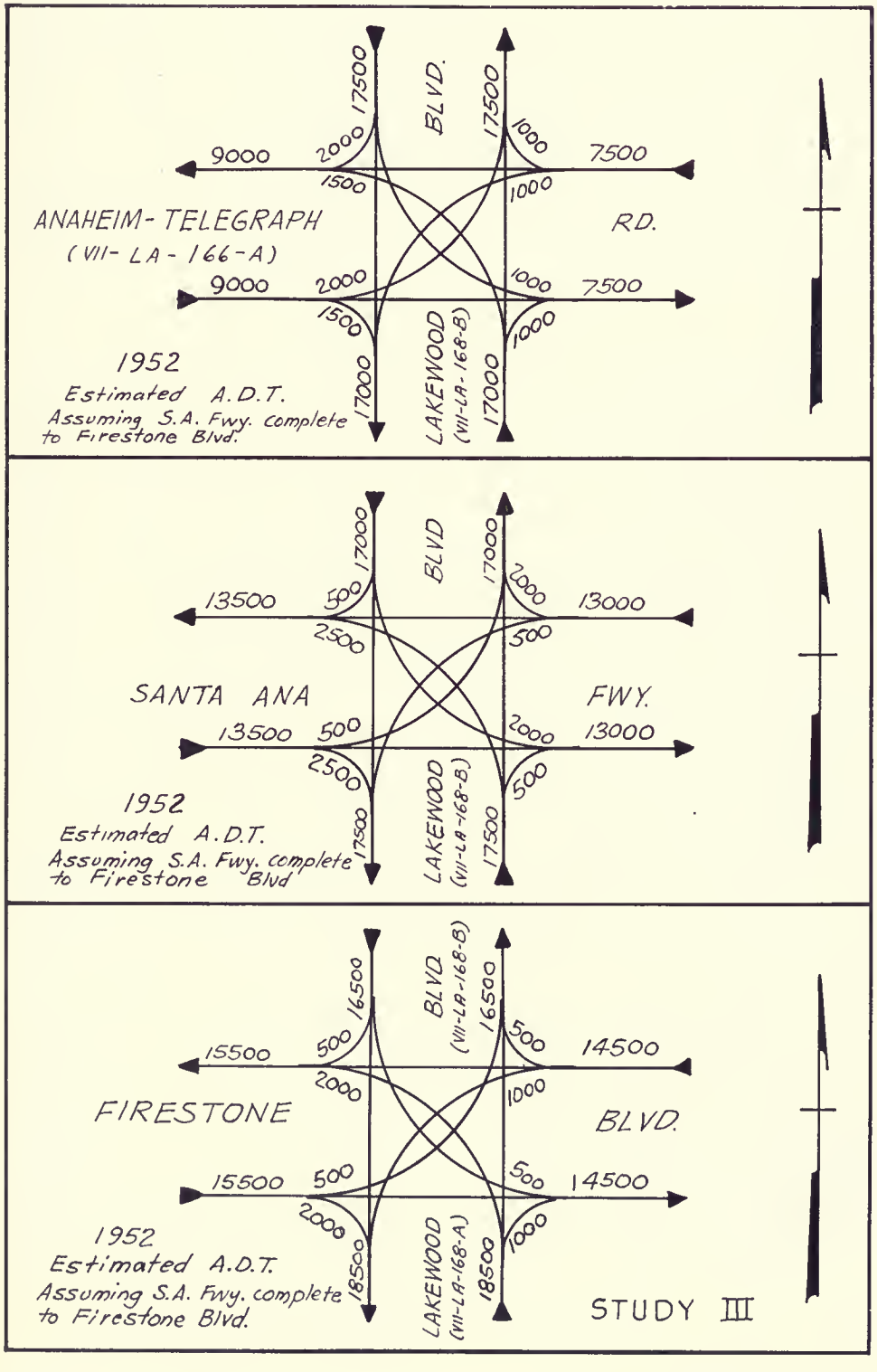
County	Route	Description	Approximate mileage	Estimated cost
San Francisco	Various	Rights of way on state highway routes		$2,250,000
San Joaquin	4 (US 99)	One mile north of Ripon to Austin Road, grade, surface and structures	3.4	1,385,000
San Joaquin	5 (US 50)	Banta Road to Grant Line Road, surface	1.9	100,000
San Joaquin-Calaveras	24 (SR 12)*	West of San Joaquin county line to Valley Springs (portions), grade and surface	5.5	350,000
San Joaquin	41 (SR 33)	At Siphon Curve, grade and surface	0.5	75,000
San Joaquin	97 (SR 88)	Plain Creek to Bear Creek, surface	1.8	50,000
San Joaquin	Various	Rights of way on state highway routes		288,000
San Luis Obispo	2 (US 101)	Through Arroyo Grande, grade and surface	1.5	180,000
San Luis Obispo	2 (US 101)	Paso Robles to San Miguel, grade and structures	6.4	940,000
San Luis Obispo	Various	Rights of way on state highway routes		230,000
San Mateo	55 (SR 1, 5)	Junction Routes 55 and 56 at Thornton to Edgemar Road (portions), grade and surface	2.2	950,000
San Mateo	55 (SR 5)	La Honda Road to Alpine Road (portions), surface	7.3	15,000
San Mateo	107	Route 68 to Southern Pacific Railroad crossing in Menlo Park, surface and drainage	0.8	141,000
San Mateo	Various	Rights of way on state highway routes		400,000
Santa Barbara	2 (US 101)	One mile east of Carpinteria to one-half mile east of Arroyo Parida and Ortega Hill to Sheffield Drive, grade and structures	3.7	1,270,000
Santa Barbara	2 (US 101)	Winchester Creek to Las Varas Creek, surface	3.7	180,000
Santa Barbara	2 (US 101)	South city limits of Santa Maria to 0.1 mile north of the north city limits, surface	2.1	160,000
Santa Barbara	138 (US 399)	Quatel Canyon and Ballinger Creek, bridges and approaches		95,000
Santa Barbara	Various	Rights of way on state highway routes		690,000
Santa Clara	2, 119 (US 101, SR 25)	Carnadero Creek and Junction of Routes 2 and 119, revise channelization and construct bridge wing walls		47,000
Santa Clara	32 (SR 152)	Cedar Creek Bridge, widen		20,000
Santa Clara	113	Route 2 to Route 68, surface and bridge	2.5	200,000
Santa Clara	Various	Rights of way on state highway routes		700,000
Santa Cruz	56 (SR 1)	1.5 miles north of Watsonville to Rob Roy Junction, surface	5.7	175,000
Santa Cruz	56 (SR 1)	At Laguna Creek, Joint Highway District No. 9, grade and surface	1.7	230,000
Santa Cruz	Various	Rights of way on state highway routes		170,000
Shasta	3 (US 99)	Boulder Creek to Project City, grade and structures	4.2	750,000
Shasta	28 (US 299)	Churn Creek Bridge, Dry Creek Bridge and Salt Creek Bridge, abutments and wings		60,000
Shasta	Various	Rights of way on state highway routes		50,000
Sierra	Various	Rights of way on state highway routes		5,000
Siskiyou	3 (US 99)	Spring Street to north city limits of Dunsmuir, grade, surface and structure	0.3	630,000
Siskiyou	82	One mile west to one mile east of Forest Mountain Summit (portions), grade and surface	1.5	285,000
Siskiyou	Various	Rights of way on state highway routes		80,000
Solano-Yolo	7	Route 6 to Woodland Wye, grade, surface and structure	1.5	600,000
Solano	208 (SR 48)	Napa River near Vallejo, redeck portions of bridge		50,000
Solano	Various	Rights of way on state highway routes		258,500
Sonoma	1, 51 (US 101, SR 12)	0.6 mile south of Venezia to 0.2 mile south of Lytton Overhead and Stony Point Road to 0.1 mile west of Northwestern Pacific Railroad, widen and surface	2.7	150,000
Sonoma	1 (US 101)	Petaluma Creek Bridge, grade and structure		900,000
Sonoma	56 (SR 1)	Jenner to Mendocino county line (portions), grade and surface	39±	100,000
Sonoma	103 (SR 28)	Route 1 to Maacama Creek (portions), grade and surface		10,000
Sonoma	104 (SR 12)	One mile west of Monte Rio to Monte Rio (portions), grade and surface	0.5	85,000
Sonoma	104	1.1 miles west of Gossage Creek to Gossage Creek, grade and surface	1.1	150,000
Sonoma	104	Petaluma Creek in Petaluma, redeck bridge		45,000
Sonoma	Various	Rights of way on state highway routes		375,000
Stanislaus	13	Modesto Irrigation District Canal, bridge and approaches		50,000
Stanislaus	Various	Rights of way on state highway routes		25,000
Tehama	47 (SR 32)	Deer Creek, bridge and approaches		90,000
Tehama	Various	Rights of way on state highway routes		28,000
Trinity	20 (US 299)	1.8 miles east of Weaverville to Douglas City (portions), grade and surface	3±	200,000
Trinity	20 (US 299)	Humboldt county line to Prairie Creek, honor camp labor, grade		325,000
Trinity	20 (US 299)	Humboldt county line to Prairie Creek, base and dust oil	17±	20,000
Trinity	Various	Rights of way on state highway routes		15,000
Tulare	4, 10 (US 99)	Visalia Airport Interchange, grade and structure		900,000
Tulare	131	Kaweah River, bridge and approaches		205,000
Tulare	134 (SR 63)	Ash Avenue to Route 132, grade and surface	0.8	270,000
Tulare	Various	Rights of way on state highway routes		450,000
Tuolumne	Various	Rights of way on state highway routes		5,000
Ventura	2 (US 101)	Calleguas Road to Central Avenue in Camarillo, grade, pave and structures	5.7	1,395,000
Ventura	79 (SR 126)	Junction Route 2 in Ventura to Junction Route 154 (Wells Road) (portions), surface and shoulders	3.4	60,000
Ventura	138 (US 399)	Meiners Road to Matilija Hot Springs Road (portions), grade, pave and structures	2.7	310,000
Ventura	138 (US 399)	At Billy Creek, Timba Creek and Berges Creek, bridges and approaches		83,000
Ventura	Various	Rights of way on state highway routes		1,110,000
Yolo-Solano	7	Route 6 to Woodland Wye, grade, surface and structure	1.5	600,000
Yolo	87 (SR 24)	Knights Landing-Ridge Cut Bridge, widen structure		24,000
Yolo	90	Winters to Madison, base and surface	10.7	140,000
Yolo	Various	Rights of way on state highway routes		59,500
Yuba	Various	Rights of way on state highway routes		100,000

* 5R = 5tate 5ign Route

Norwalk Diagonal

Continued from page 23 . . .

Also, the vehicular speeds of 50 m.p.h. and 35 m.p.h. for the freeway and the existing routes, respectively, are both decidedly conservative values and tend to minimize net user savings. Notwithstanding these conservative assumptions, a net annual savings of $1,238,445 starting in 1954 after opening of this section of the Santa Ana Freeway seems assured for the users of the Norwalk Diagonal.



The following is an economic comparison in user costs for a single passenger car using the freeway or the major existing route:

FROM JUNCTION SANTA ANA FREEWAY AND LAKEWOOD BOULEVARD TO JUNCTION SANTA ANA FREEWAY AND FIRESTONE BOULEVARD

Distance via Santa Ana Freeway	5.18 mi.
Time via Santa Ana Freeway @ 50 m.p.h.	6.22 min.
Mileage cost per vehicle @ $0.03 per mi.	$0.1554
Time cost per vehicle @ $0.02 per min.	0.1244
Total cost per vehicle	$0.2798
Distance via Lakewood and Firestone Boulevards	6.69 mi.
Time via Lakewood and Firestone Boulevards @ 35 m.p.h.	11.48 min.
Mileage cost per vehicle @ $0.03 per mi.	$0.2007
Time cost per vehicle @ $0.02 per min.	0.2296
Total cost per vehicle	$0.4303

History Behind Mokelumne Hill

Motorists who pass through Mokelumne Hill in Calaveras County are not always aware of the colorful history that lies behind this little town. "Moke Hill," as it is popularly known, has quite probably seen more of gold mining, of bloodshed and battles, than any other town in the area.

Early in 1849, according to the National Automobile Club, a small band of discharged soldiers wandered onto the site of the present town, pitched their tents, and settled down to look for gold. Within a very few years the ground had proved itself to be so rich in the metal that the population had soared up to around four thousand, individual miners were taking as much as $20,000 from claims no more than 16 feet square, and a single area on the southern edge of town was well on its way to producing around $30,000,000 worth of gold. Mokelumne Hill had become a "boom town" in the truest sense of the word.

Moke Hill was a prosperous trading center for the nearby camps and served as the county seat of Calaveras County from 1852 to 1866.

When the gold had gone, however, the men went too, and today Moke Hill has simmered down to a small Mother Lode town with a population of little over 500.

Streets to Freeeways

Continued from page 4 . . .

and Highways Code contains this provision:

> "It is hereby declared to be the policy of the Legislature to provide for advance planning and continuity of fiscal policy in the construction and improvement of the State Highway System and in the administration of expenditures from the State Highway Fund. The California Highway Commission is directed to follow such policy insofar as possible."

The Highway Commission and the State Highway Engineer, in my opinion, have endeavored in good faith to adhere to this sound policy, which is responsible for much of the progress we have made in recent years.

Critical Deficiencies

As indicated by the chart, the 1951 estimated cost of bringing our present highway system up to adequate standards is approximately $3,000,000,000. Under the present system of financing, the engineers tell me it will take 30 years, or more, to achieve this improvement. This is without provision for further cost increases or additional increased needs due to our continued rapid growth. Neither does it take into account the possibility of further additions to the State Highway System.

The Collier-Burns Act, itself, provided for the expansion of the State Highway System by approximately 75 miles, much of it in highly developed metropolitan areas where freeways are needed. The estimated construction cost on this mileage alone is more than $268,000,000.

Public Awareness

We should all be encouraged by the increasing tendency of people everywhere to ask some long-range and very searching questions about their highways and their functions. We are finding a highly gratifying awareness on the part of the public of the existence of the highway problem as a whole. Highway users are increasingly concerned with traffic safety, and are impressed by the fact that fatal accidents on full freeways occur only one-fifth as often as they do on the rural state highway system as a whole. They are aware of the saving in time and money accruing to them as a result of freedom from stop lights and congestion.

Civic leaders of our cities are becoming increasingly aware that development of an adequate over-all local transportation network is a life and death matter for the downtown business district. They are proving this awareness by their long-range planning and zoning measures, and particularly by their growing determination to provide off-street parking facilities. They are insisting on comprehensive planning to insure the permanent value of their street improvement programs.

Broad State-wide View

Most encouraging, people in all parts of California are coming more and more to see their interdependence in highway matters. They are taking a broad, state-wide view of what is essentially a state-wide problem.

This enlightened attitude is the brightest spot on our highway and transportation horizon. It cannot fail to be translated into intelligent action which will point toward a real solution of our difficulties. Its fruits are already evident in the coordinated attack which is being made on highway problems in more and more sections of the State. The officials and engineers of the State Division of Highways are sitting down with the staffs of city, county, and regional planning commissions, and with other officials of city and county governments. They are endeavoring to weigh all the multiple and complex factors which make up the local and regional transportation picture, and fitting it into the state-wide picture. They enchange facts and ideas about land use, soil conditions, local economic trends, traffic data, construction costs, and engineering problems. They measure the effect of a local road or street improvement on the state highway with which it connects, and of the improvement of state highways on the local systems.

In other words, we have the foundation for a good start on the solution of our street, road, and highway problem. First, we have achieved the necessary atmosphere of teamwork which makes possible a coordinated effort. Second, there is the growing awareness of the complex nature and the vast extent of the transportation problem. And, finally, there is general agreement that recognition of the serious traffic problems within cities, and in the expanding metropolitan areas, must be balanced by recognition of the needs of rural areas. California's highway transportation system, if it is to be truly suited to present-day and future requirements, must be designed as a properly integrated network of city streets, county roads, and state highways.

Long Beach Freeway

Continued from page 15 . . .

It further contemplates a one-way street system into the downtown area with provision for two one-way bridges in the general vicinity of Broadway and Third Street, respectively.

The active subsidence in this general area which has already resulted in six feet of settlement in the vicinity of Ocean Boulevard with an additional predicted ultimate subsidence of approximately 10 feet has resulted in a very serious flood hazard, for which remedial work is an early must. Accordingly, the Army and County Flood Control Engineers have scheduled raising the levees and reconstruction of the bridge improvements to start in the spring of 1953. Time being of the essence, all planning and construction by the many agencies involved must be expedited to the utmost. The following remarks as to our program, both current and future, will give a brief insight into the magnitude of the problem.

Storm Drain Pump

Nearing completion is the section between Anaheim Street and Pacific Coast Highway, which includes the $125,000 storm drain pump station constructed by Gardner & McCall, together with a $140,000 paving contract by Boddum Construction Company. Nearing completion also is the Guy F. Atkinson $2,000,000 contract with the Harbor Department of the city for the Anaheim Street Bridge and its inter-

. . . Continued on page 38

Long Beach Freeway

Continued from page 37 . . .

change with the freeway. Architectural and engineering contracts have been awarded to Moffatt & Nichol for preparation of plans for the $4,086,000 Ninth Street Bridge and to J. Herb Davies of this city for preparation of plans for the $4,376,000 Ocean Boulevard Bridge.

To provide a detour during construction of these new bridges, bids are to be received by our Harbor Department, on November 13, 1952, for moving the Ocean Boulevard Bridge southerly to Santa Cruz Avenue at an estimated cost of $227,000, including demolition of piling at the present bridge location, levee work, and new bridge approaches.

Acquisition Cost $4,000,000

The removal of the existing Seventh Street Bridge and its replacement with a railway bridge, just south of Ninth Street, at an estimated cost of $750,000, as well as the ultimate replacement of the existing Broadway Bridge with one or more bridges between Ocean Boulevard and Ninth Street, will be required to adequately handle the traffic. It is conservatively estimated that the total acquisition cost for the freeway development, south of Pacific Coast Highway, will be $4,000,000 with additional millions of dollars required for the Broadway Bridge replacement, construction of the on and off ramps, railroad work, and extension of the freeway and service road improvements.

A major portion of the complex financing on this all-embracing program will be defrayed from Long Beach Harbor and General City Funds. However, the Los Angeles County Flood Control District will participate in financing the replacement, in kind, of the bridges which must be removed as a part of the Army Engineers-Flood Control and levee work which will be done with federal moneys. The Pacific Electric Railway, oil producing facilities and many utilities are, likewise, involved in this very comprehensive program, which is further complicated by our big hurdle: *Subsidence*.

Old Timers in Division of Highways Honored



State Highway Engineer George T. McCoy presents certificate to Fred J. Grumm, retired Deputy State Highway Engineer. Director of Public Works Frank B. Durkee on McCoy's left and Assistant State Highway Engineer Charles E. Waite in background.

CERTIFICATES for 25 years of service with the State of California were awarded at a dinner at the University Club in Sacramento on November 14th to 53 long-time present and retired employees of the Division of Highways in the Sacramento area.

The guests of honor were introduced by Assistant State Highway Engineer C. E. Waite, and received their 25-year awards, consisting of a framed certificate and a pin, from State Highway Engineer George T. McCoy. Brief talks were given by Frank B. Durkee, State Director of Public Works, and by McCoy.

With a few exceptions, the recipients of the certificates at the dinner are employees from the Division's headquarters office. Other Division of Highways units in the Sacramento area will hold separate presentation ceremonies, as will the division's 11 district offices throughout the State. A few of the retired employees at the dinner served in other parts of the State but now make their homes in the vicinity of Sacramento.

The honorees and their years of service as of December 31, 1951, are as follows:

Present employees: William Bock, 32 years; Lawrence V. Campbell, 32; Edward F. Carter, 30; George N. Cook, 29; Lloyd D. Craig, 26; Mrs. Coral E. Davis, 30; Leo S. Fahy, 30; George F. Hellesoe, 26; E. Roy Higgins, 30; F. N. Hveem, 34; Wilburn H. Irish, 32; George A. Karsten, 26; Harold B. LaForge, 32; Henry L. Mahoney, 30; Herbert S. Marshall, 27; Robert W. McCrea, 29; William C. McNeely, 37.

Luke D. Packard, 26 years; Mrs. Helen F. Randolph, 29; Bertram A. Reber, 28; Rodney F. Reynolds, 33; A. Irving Rivett, 36; Emil J. Saldine, 26; William J. Stonebraker, 26; Baynard A. Switzer, 27; Ray B. Vernon, 27; J. Wilbur Vickrey, 34; Herbert A. Waterman, 32; Durward Wickham, 25; Richard H. Wilson, 28; Earl Withycombe, 30; Clarence F. Woodin, 33; Joseph O. Zink, 28.

Retired employees: Charles M. Butts, 39 years; Herbert L. Cooper, 26; Mrs.

. . . *Continued on page 64*

THE UPS AND DOWNS OF BRIDGE CONSTRUCTION

By J. W. GREEN, Southern Representative, Bridge Department

WHERE CONSTRUCTION work is nearby or along heavily traveled traffic arterials where detours are not feasible to maintain, State Division of Highways specifications always require that the contractor shall pass traffic through construction and conduct his work so as to offer as little inconvenience and delay to public traffic as possible. When public traffic has to be shut off from sections of such important freeways as the Santa Ana Freeway and the Ramona Freeway, this becomes news. Not only do the local newspapers carry the stories, but moving pictures are taken and shown in newscasts over television. Particularly is this so when the closing is caused by massive structural steel assemblies being raised up or taken down. Both of these operations occurred recently in District VII within one week of each other.

Temporary Bridge

On October 21, 1952, it was necessary to close the section of Anaheim-Telegraph Road adjoining the Santa Ana Freeway, between Washington Boulevard and Slauson Avenue, in order to permit the taking down of structural steel girders of the temporary shoo-fly bridge that carried the Santa Fe Railroad traffic over Anaheim-Telegraph Road. The closing of this important traffic arterial was necessary so that the Consolidated Western Steel Corporation could bring in mobile cranes and take down the 24-ton structural steel girders in the shoo-fly bridge. This temporary bridge had been erected over Anaheim-Telegraph Road a short distance southerly of the main line of the Santa Fe Railroad in order to provide a shoo-fly, or by-pass, for railroad traffic around the construction for the new railroad grade separation bridge on the Santa Ana Freeway, known as the Simons Underpass.

Simons Underpass

Simons Underpass is a structural steel through girder-type bridge carrying the two main line tracks and two lead tracks of the Santa Fe Railroad across the Santa Ana Freeway. It consists of two spans each, approximately 104 feet long, supported on reinforced concrete abutments and a center pier of struc-

Southerly section of Evergreen Avenue pedestrion overcrossing being swung into place by three truck cranes. Closing of Ramono Freeway to public troffic wos required during this operotion. Photograph by Consolidated Western Steel Corporation.





tural steel columns. There are four structural steel girders connected by 21-inch and 30-inch floor beams, with a total weight of 1,250 tons. The interior girders are over 11 feet in depth and weigh 192 tons each. They were fabricated in three parts, the largest weighing 76 tons. These interior girders weigh over one ton per foot, being possibly the heaviest per foot that the bridge department has yet designed. The two interior steel columns weigh 23 tons each. There are about 3,000 cubic yards of concrete in the abutments, wingwalls and center pier footings. The main girders were fabricated by the American Bridge Company and all other structural steel by the Consolidated Western Steel Corporation. All erection was done by the latter company.



UPPER—New Simons underpass structure nearly completed and carrying main line Santa Fe Railroad trains over Santa Ana Freeway now in process of construction. LOWER—Dismantling operations at Simons underpass shoo-fly bridge structure with mobile crane about to place girders on truck and trailer. J. M. Curran, Resident Engineer, left, and A. D. Griffin, Assistant District Engineer, observe operations. Photo by Los Angeles Times.

Construction Difficulties

Due to the extreme weight of girder sections, it was a difficult erection job. The center sections of the interior girders were erected by two 20-ton and two 40-ton cranes. The interior columns of the center pier were erected by two 20-ton cranes and placed on anchor bolts six feet long and three inches in diameter. These anchor bolts were cast in 20- x 40-foot concrete footings.

The field rivets were all one-inch in diameter and varied in length to over 11 inches, which is considered something of a record for length. All rivets over 8⅝ inches were tapered one thirty-second inch to enable a better job of filling the rivet holes with the rivet shank. Difficulty was encountered in driving rivets between the floor beams because of the limited space between them. It is interesting to note that the erection of the 1,250 tons of structural steel and driving of 30,000 field rivets was completed in a little over 10 weeks.

Shoo-fly Bridge Removed

The Simons Underpass was completed and opened to the full load of railroad traffic on October 6, 1952. Then followed the removal of the railroad shoo-fly and the shoo-fly bridge.

Dismantling operations went off according to schedule. After removal by the mobile cranes and loading on trucks, the girders were hauled to the local yard of the Consolidated Western Steel Corporation for reconditioning, loading on freight cars, and shipment to the Santa Fe Railroad storage yard at San Bernardino. These girders were the property of the Santa Fe Railroad and had been rented to the State for the year's time during which the railroad shoo-fly had to be kept in operation. This was a highly satisfactory arrangement because at the time of the erection of the shoo-fly bridge structural steel was in critical supply.

The railroad shoo-fly work and the construction of the Simons Underpass railroad grade separation bridge, costing approximately $800,000, were carried out as a part of the United Concrete Pipe Corporation contract for Santa Ana Freeway construction between Washington Boulevard and Todd Avenue. The resident engineer on the bridge construction is J. M. Curran.

Traffic Control Problem

One week after the dismantling operations at the Simons Underpass, it was necessary to close the Ramona Freeway in the City Terrace area east of Los Angeles for a period of three hours for a similar operation, but in reverse, with prefabricated, welded structural steel bridge sections being raised up into permanent position over the freeway and over the Pacific Electric Railway.

The erection of structural steel for the Evergreen Avenue Pedestrian Overcrossing created quite a problem in the coordination of traffic control. The largest of three girder bridge sections, a 138-foot, 21-ton steel section, was hauled from the Consolidated Western Steel Corporation plant located in southwestern Los Angeles over city streets, and was finally erected over the heavily traveled Ramona Freeway. Due to the extreme length of this section of the bridge, erection had to be done in such a manner that both the eastbound and westbound lanes of the freeway were closed. To accomplish this all traffic had to be detoured and rerouted over a distance of three miles, requiring the close cooperation of various public and private agencies.

Pedestrian Overcrossing

This pedestrian overcrossing connects a shopping center and school area in City Terrace with a housing project of the Los Angeles City Housing Authority. The 310-foot bridge spans the six-lane westbound and eastbound Ramona Freeway and south frontage road, two tracks of the Pacific Electric Railway, and an area reserved for a future city street. The structure is supported at the ends on reinforced concrete abutments, with stairways provided. Three concrete piers, 25 feet in height, support the center span and the southerly span. An eight-foot reinforced concrete slab walkway is being provided, which is supported between the five-foot welded steel girders on steel floor beams. All piers and abutments are supported on "cast in place" concrete piles driven to a minimum bearing of 32 tons per pile. A steel picket-style fence will be provided along the top of girders and pipe handrail will be constructed for the entire structure.

Center Span Erected First

The center and highest span was erected as the first operation. The north span crossing the railway tracks was placed as the second operation, one end of which was attached to the hinge on the center span cantilever. This latter operation detained two Pacific Electric freight trains about one-half hour. The third section on the south side of the bridge was the most difficult to place and caused the Ramona Freeway to be closed for about three hours during midday when traffic was the lightest.

Erection of the steel girder sections required the use of three 12-ton truck cranes owned and operated by the Consolidated Western Steel Corporation. The total length of the south span, including hauling equipment, was in excess of 160 feet and was transported to the site by the Belyea Truck Company of Los Angeles. As there were few routes from the company yard to the site that could accommodate this length, the hauling was successfully made along City Terrace Drive, over Eastern Avenue Bridge, down Murphy Street and Ramp Underpass, and westbound to the bridge site on Ramona Freeway.

Eastbound traffic was carried off the freeway at Fickett Street and westbound traffic was diverted at the recently completed Murphy Street Ramp Underpass. Credit should be given to the Police Department of the City of Los Angeles, Hollenbeck Division, and the California Highway Patrol for the successful handling of traffic.

This $85,000 contract is being carried out by J. E. Haddock, Ltd., of Pasadena. George Wiggers is bridge superintendent. Completion date of all work on this structure will be early in 1953. The resident engineer on this contract is W. A. McIntyre.

FROM WISCONSIN

THE STATE OF WISCONSIN
HIGHWAY COMMISSION

MILWAUKEE 2
November 6, 1952

California Highways and Public Works
Sacramento, California

GENTLEMEN: We wish to express our thanks and appreciation for being included on your mailing list for *California Highways and Public Works.*

The informative and constructive way in which you present your highway programs and construction methods and the descriptive and interesting manner in which you call attention to the many varied resources and natural beauties of your great state make it one of the best magazines which we receive.

Yours very truly

STATE HIGHWAY COMMISSION
OF WISCONSIN
JOSEPH A. STRANSKY
Division Engineer

FROM AUSTRALIA

VICTORIA, AUSTRALIA

KENNETH C. ADAMS, *Editor*

DEAR MR. ADAMS: Having received your magazine during the last year, I would like to take the opportunity of thanking you for forwarding it to me.

I have found the articles and photographs of the greatest interest.

Yours sincerely,

IAN R. RANKIN

Life Line

Work of Driving Snow Poles In Mono County Is Completed

By W. L. SAVAGE, Assistant District Maintenance Engineer

THE ANNUAL JOB of driving snow poles along the state highways in Mono County in District IX has again been completed. This operation has to be rushed in order to be completed in the few weeks between the summer oiling season, fall grading of shoulders, and freezing weather which tightens up the earth shoulders making the work more difficult. All members on the five crews along US 395 are engaged for a period of three weeks on this work of installing approximately 7,000 poles.

During blizzard type snowstorms the line of orange poles defining the edge of the roadway is quite often the motorists' only guide as to where the roadway is and after storms which completely obliterate the highway the poles are used as a guide by the operators of the Snogos to again open the road to traffic.

Poles now being used are metal, painted orange, 4 inches wide and 10 feet long, shaped to a flattened U form. The metal poles are far superior to the 2 x 2 inch x 10 foot wood poles used prior to 1947.

Spacing of Poles

Poles are placed at a uniform distance approximately 13 feet from centerline near the outside edge of the normal shoulder, in open country on the side against the prevailing winds as shown in accompanying photos, and on hillside locations on the downhill side. On tangents in locations where drifting is not serious the poles are spaced uniformly at approximately 66 per mile by counting a certain number of revolutions of the rear wheel, on which is placed a marker for a guide. Spacing at other locations and on curves varies with the snow, wind peculiarities, and curvature. All culvert markers, ends of guard rail and other obstructions which may be covered by snow are marked by a pole. The operation of driving the poles requires three men and a two-ton truck on which a wood framework approximately seven feet above the surfacing is placed. One man operates the truck, one man stands in the framework and drives the pole with an eight-pound sledge hammer, and one man lines up and holds the pole while it is being driven. The jobs are rotated during the day to spread the work of driving the poles.



Driving snow poles by hand

High Winds a Problem

Driving this fall was slowed down by the unusually dry earth shoulders. Usually a late summer or early fall rain occurs which softens the shoulders making driving much easier.

When the wood poles were being used the replacement rate was high



After snow storm, poles outline road

due to breakage and deterioration, however, they withstood the effects of wind much better than the metal poles. The 10-foot metal poles used were fabricated of brittle steel. They are driven approximately one foot below ground and the nine feet above develops a terrific vibration during high wind and as a result fatigue develops near the frozen ground or hard snow line.

During strong winds the narrow metal poles sometimes appear to be one foot wide when viewed from a distance as a result of the back and forth vibration path. One employee reported seeing a metal pole break off at the frozen snow line and hurled through the air by the strong wind. An approximate 15 percent breakage of poles occurred last winter due to wind, contact with snow removal equipment during the periods of zero visibility and other causes.

During the winter of 1950-51 an experiment of attaching sheets of scotchlite and standard reflectors to the poles to identify them was tried. The reflectorizing attachments stood out during calm weather, as shown in *accompanying photo*, but were not visible during snowstorms.

Snow poles are placed on approximately 150 miles of highway in District IX being installed between October 15th and November 15th and removed approximately April 1st or as conditions govern.

Standard three-inch reflectors attached to snow poles



WASHO Road Test

Continued from page 23 . . .

neers and the highway transportation industry to develop factual information upon which to base design of highways for heavy truck loads, to guide legislators attempting to draw equitable tax laws for highway users, and to help truck manufacturers and operators to determine reasonable and efficient vehicle operating sizes and weights.

The test pavement of the WASHO project is in the form of two loops, one of which will be tested under trucks with tandem axles and one under single-axle trucks. Each loop has two tangents both of which contain five 300-ft. test sections. The five sections in each straightaway have different total thicknesses of granular base plus bituminous mat ranging from 22 inches to 6 inches. On the tandem-axle loop, tractor-semitrailers will operate in one lane with 40,000-lb. tandem-axle loads, and in the other lane with 32,000-lb. tandem-axle loads. Tractor-semitrailers with single-axle loads of 22,400- and 18,000-lb. will operate in the two lanes of the other loop. Instruments are being installed in the pavement to measure quantitatively the relative effects of these loads on the pavement, and the visible damage to the various pavement sections, if any, will be carefully studied.

Special studies of the deflections in the pavement under a limited number of other (lower) axle loads at various truck speeds are now under way. The regular test, which will consist of 18 hours of truck traffic per day over the test sections, six days a week, will begin early in November. According to present plans, this traffic will be discontinued during the winter and started again in the spring or early summer. By the fall of 1953, when the principal program of tests will be completed, each test section will have been subjected to over 200,000 heavy axle loads.

IMPROPER PASSING RISKY

Passing another car on a curve or hill is such an obviously reckless procedure, it is amazing that motorists will attempt it. However, enough of them tried it last year to cause the death of 310 persons and bring injuries to 5,800 others.

Early Days

Minutes of First Highway Commission In 1913 Make Interesting Reading

By R. C. (CASS) KENNEDY, Secretary, California Highway Commission

(Continued from last issue)

At the first meeting of the Highway Commission in 1913, J. P. Sherbesman, who was editor and manager of *Western Excavator* published in San Francisco, requested the commission to place his name on the mailing list for the *Bulletin* and that he be notified when the commission advertised for bids. This is the first entry regarding the magazine, now *California Highways and Public Works*, since the notice that the commission had decided to publish one every month.

At the present time, our *California Highways and Public Works* magazine has a circulation of approximately 30,000 copies. It goes to 43 foreign countries; to all the state highway departments of the 48 States of the United States, and to many colleges, universities and libraries.

If you remember back to where a letter had been received from somebody regarding the width of tires on wagons and buggies, you will realize that even in those days excessive loads evidently were breaking down our highways. An item in the minutes of the first meeting of 1913 shows that a telegram had been received from Kaleb Tanner, secretary of the State Road Commission of Salt Lake City, Utah, requesting a copy of our "Wide Tire Laws." Evidently, some steps were being taken to try to protect our highways even in those days.

Bids for Laboratory

Bids for the 16 x 16-foot Laboratory Building were opened on the last day of January, and a firm called Siller Bros., of Sacramento, was the low bidder with a bid of $805. Residents of Sacramento may remember this firm. It had a planing mill on 13th Street between P and Q Streets, and a lumber yard on S Street between 12th and 13th Streets. In addition to running the mill and selling the lumber, the firm also contracted on the side for building purposes.

After the contract for the Laboratory Building had been let, the contractor suddenly discovered that he had forgotten to add $180 for the cost of plastering, and Siller Bros. refused to sign the contract. Whereupon, the commission rescinded the contract, or rather the award of the contract, and voted to go ahead and build the building by day labor.

Back in 1913, the commission was getting safety-minded apparently. An attorney from San Francisco appeared before the commissioners and urged that attention be given the matter of providing in proposed legislation regulating motor cars, that adequate signal devices be required upon automobiles. The notes from the minutes do not state what kind of signal devices should be required.

Available Funds in 1913

On February 4, 1913, the Highway Engineer submitted a statement to the commission, entitled, "Estimated Available Funds for Highway Contracts and Expense of Administration." His first entry is "Bonds Sold to Date, $2,000,000," and from that amount he takes out $1,207,000 reserved for contracts, and $140,000 for materials to be delivered in the future; and $144,000 for administration purposes; $221,000 plus for payments on contracts 1 to 18. He also lists $67,000 worth of equipment and about $390,000 for expenses, and shows that there is allotted $1,700,000 for reserves and expenses to date. That left available for new state highway contracts the large sum of $273,283.67. In this day and age that wouldn't go very far.

At the afternoon meeting on March 21, 1913, a number of asphalt contractors appeared before the commission and complained bitterly that the specifications of three-eighths to one-half inch of asphaltic concrete wearing surface was not enough. They had no complaint to make of the concrete base construction, but they did say that they should have at least two inches of asphaltic concrete wearing surface. This would cost approximately $12,000 extra per mile, and they admitted that it would be impossible to complete the highway system under the $18,000,000 bond issue. The Highway Engineer insisted that the interest at 4 percent on the excess cost of the construction proposed by the contractors was more than sufficient to maintain the thinner wearing surface which the commission proposed to use.

Present Specifications

Whether the contractors were right in that day and age is a question that can be argued from now to Doom's Day. Traffic at that time was comparatively light and the number of automobiles was comparatively few, but the contractors were apparently away ahead of their times.

At the present time, our specifications call for three inches of plant mix. "Plant mix" is the same thing as asphaltic concrete. So, probably the contractors were not as far wrong as they might have been.

Our No. 1 contract was in San Mateo County on El Camino Real. A small section of this original highway was still in existence opposite Tanforan Race Track, with a thin asphaltic concrete top, up until about four years ago, when it was repaved.

On March 26, 1913, the commission took a far, far look at things and decided that the premiums on the bonds of the division engineers be reimbursed to them upon the presentation of their paid vouchers for such premiums. Up to a short time ago, this was still in effect, but now, the Division of Highways buys a blanket bond, as it is called, which covers every employee of the State Highway Division. This is common practice with all large organizations.

Big Transactions

There are a couple of items in the minutes of the April meeting that I think will give some people a chuckle. At that time, the commission sold one horse for $100, and sold one team of black Geldings, including halters; one pair of old horse blankets, and one set of harness, including bridles and collars, for $370, and it also sold two sets of harness—one set with collars and one set without collars, for $38. These transactions take up a little better than one page of the minutes, as the commission had to vote that all of this money had to be turned in to the State Controller and to request the State Controller to credit these amounts to the State Highway Fund. Again, later on that month, at another meeting, the commission sold another set of double harness for $22.50. This item takes up twelve to fifteen lines in the minutes in order to get the amount back to the State Controller and properly credited to the State Highway Fund.

Salary Increases

In May of 1913, the Highway Engineer proposed some new titles and some new pay rates. Division Engineers were to be raised to $325 a month; Assistant Division Engineers to $200 per month; and Assistant Highway Engineer from $275 to $325 a month. State Highway Engineer Fletcher also requested that the office known as Assistant State Highway Engineer be designated as the First Assistant Highway Engineer, and that a new office of the Second Assistant Highway Engineer be created. All this was done by votes.

The State Highway Engineer started a new section by creating the position of a Bridge Engineer at $300 a month. The commission also voted to buy a hydraulic testing machine for crushing concrete cubes. This was made in Philadelphia, and the purchase price was to be $315 f.o.b. Philadelphia. Naturally, this was to come out to Sacramento and be installed in the commission's new laboratory.

There is also a note in the minutes of May, 1913, that F. P. Borgnis, heretofore employed as chief draftsman at headquarters, at a monthly salary of $165, be transferred to the position of Special Right of Way Agent, to report directly to the attorney without change of salary. This, if I remember correctly, is the first notice of the start of the Right of Way Division of the State Highway Department.



Concrete mixer on state highway near Roseville, Placer County, in 1913

Railroad Underpass

In May, 1913, there is also the first mention of an underpass under a railroad. The commission had quite a discussion regarding the proposed underpass under the Southern Pacific Railroad about one mile west of Roseville in Placer County. The Southern Pacific was opposed to grade crossings. Difficulties were run into because the County of Placer refused to bear its one-half share of the cost of the underpass. The railroad company offered to pay its one-half. So the matter was referred to the Railroad Commission to determine what proportion of the expense should be borne by the railroad company and what part by the State.

The Roseville underpass finally was completed April 1, 1950, at a cost of $1,485,000.

In June, 1913, the commission transferred C. L. Rakestraw to the position of Right of Way Agent in Division IV at $150 per month. The Right of Way Department was beginning to take shape.

Forerunner of Bayshore Freeway

In July, 1913, a delegation from San Francisco, Burlingame and San Mateo appeared before the commission and very strongly urged the widening of the pavement for all of the state highway through San Mateo County, and especially of those portions in the southerly part on which the contracts had been let for only 20-foot width. This delegation stated that San Francisco County, which was paying one-third of the taxes for the roads, was having no money spent within its limits, but was vitally interested in seeing that the single main state highway running south from San Francisco and all down the peninsula as far as San Jose should be at least 24 feet in width.

The delegation stated that already the traffic was so congested, with only a small portion of the work done, that the stream of automobiles was blocked on the 24-foot width—and this, before the road was completed and before there was any impetus to travel such as would occur at the time of the World's Fair in 1915. The delegation stated that in justice to the combined interests of San Francisco and San Mateo Counties the highway should be widened from 20 to 24 feet.

Thirty-nine years after this delegation asked for the widening, the Highway Commission allotted moneys to build the Bayshore Freeway through San Francisco, San Mateo, and Santa Clara Counties, connecting San Jose and San Francisco.

Evidently in 1913, quite a number of jobs were done by day labor or by the Highway Division, for on August 26, 1913, the commission voted that the Highway Engineer be empowered to purchase two Buffalo-Pitts 12-ton steam rollers, at the price of $3,250 each. One would be used in El Dorado

County, and the other one in San Luis Obispo County.

Grade Crossings

Apparently, the commission was having some trouble with crossings by public utilities, for on this date it requested of the State Railroad Commission that all applications for permission to make grade, overhead or underhead crossings of public highways should contain the information whether or not said crossings affect the state highways, and that in such cases the Highway Commission should be so advised and given an opportunity to be heard in the matter.

On September 23, 1913, the commission received a letter from the Kirkman Nurseries, Inc., of Fresno, asking permission to plant shade trees along the state highway in Fresno and Madera Counties. The secretary was instructed to write and thank the nurseries for its letter and to say that the commission favored the planting of trees to afford shade and produce the most satisfactory growth, regardless of telegraph lines along our state highways.

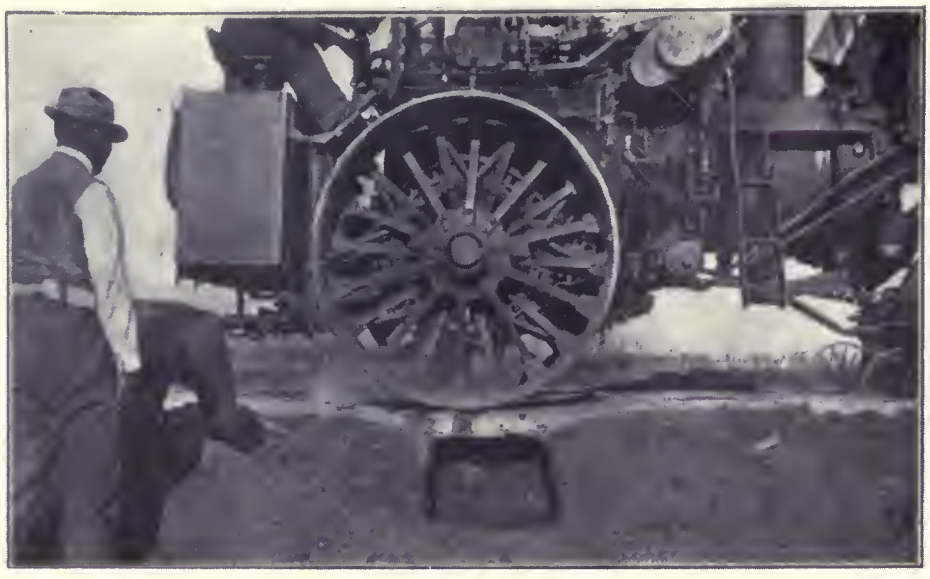
El Dorado Petition

In October of 1913, the Highway Engineer was authorized to dispose of a Franklin automobile, then assigned to Division VI, at the best possible price, and was authorized to purchase an Overland, five-passenger car, 1914 model, to take its place, at a price not to exceed $1,200. Evidently, the roads in that day and age were wearing out the cars in about a year's time.

Also in October, the Highway Engineer stated that the citizens of El Dorado requested that the macadam pavement through the town be widened from 12 to 20 feet. This was voted, provided that the citizens donated to the State Highway Fund the sum of $350 to defray the cost of such widening.

In November, 1913, the Highway Engineer reported that he had forwarded to the State Controller the sum of $350 which had been donated by certain El Dorado citizens. This money was for the purpose of widening the state highway through the town of El Dorado.

In November of 1913, the Advisory Board of the Engineering Department passed a long resolution giving the California Highway Commission additional jurisdiction and powers. The Highway Commission was to take full control and disposition of the moneys accruing to the State for the maintenance of state highways from the revenues of the Motor Vehicle Act. And it was to take full charge of the maintenance of state highways contemplated to be maintained by the Motor Vehicle Act, and to perfect such organization as might be deemed necessary to carry on with "celerity and efficiency" the work to be done in maintaining the state highway. And that is how the Division of Highways took over the maintenance of state highways.



Testing four-inch base on state highway in 1913

There was a request from a contractor who had a contract to construct a portion of the state highway between Encinitas and Oceanside in San Diego County. He asked that he be permitted to use ocean water in mixing concrete for the construction of the highway. This is common practice today, where fresh water is not immediately available and where the work is being done very close to salt water. It seems that our laboratory has decided that salt water has little or no effect upon the wearing and lasting qualities of concrete.

No Money for Experiments

On December 29, there appeared a group of people from San Francisco, headed by J. A. Marsh, president of the Motor Car Dealers' Association of San Francisco, who urged that the commission build a strip of experimental highway for the purpose of testing out various kinds of road-building methods. This group urged that about eight miles each of brick pavement, Warrenite pavement, and various kinds of asphaltic concrete and bituminous surfaced roads be constructed at an outlay of $100,000 or more. The speaker stated that his attention was first called to a matter such as this by observing on a trip to Seattle some years before that experimental roads of this character had been built in that section and had resulted in educating the public in practical road construction. It was explained by Commissioners Darlington and Blaney that the commission had no money available for such experimental road construction. But it was explained that the commission would gladly undertake such construction if the money were provided as a donation by outside parties. That seems to have ended that discussion.

Right of Way Department

On December 29, 1913, the commission voted that George B. Harrison, who resided in Los Angeles, be employed as Chief of the Right of Way Department. His term of service was to begin on December 16th and he was to get a monthly salary of $200 per month.

At the present time, there are approximately 550 people employed in



First highway laboratory built at State Fairgrounds in 1913

our various right of way sections in our 11 districts and our Headquarters Office here in Sacramento. These people are busy on nothing but right of way matters.

Also, on this date, a letter was received from F. W. Steelins, Assistant Cashier of the Bank of Woodland, with reference to a proposition to sell to the State the so-called "Craig and Stevens Toll Road" between Lakeport and Pyeta, commonly known as the "Squaw Rock and Highland Springs Toll Road." The letter stated that the cost to the State would be much less than the original cost of the road and it could be used as a lateral into Lake County. This matter was referred to the State Engineer for his recommendations.

Yolo Causeway

On December 30th, a delegation, consisting of businessmen of both Yolo and Sacramento Counties, appeared before the commission and tried to learn the probable cost of the construction of the proposed causeway and state highway from Sacramento to Davis, crossing the Yolo Basin. Highway Engineer Fletcher stated that the State proposed to construct the causeway upon driven concrete piles, and that the total length of the trestle work would be approximately 16,000 feet; 14,000 feet of this would be of a permanent character and the remainder of wood and cheaper construction. The estimated cost of this concrete trestle would be approximately $415,000. In addition to this, seven and one-half miles of graded and paved highway from the trestle to Davis, including a subway passage under the Southern Pacific tracks, would bring the cost up to $500,000. That did not include the cost of the connecting link between the causeway and the City of Sacramento along the levees of the West Sacramento Valley Company's lands, as proposed. The Highway Engineer's total estimate, including the 10 percent for overhead charges, was $625,000.

The question of financing this causeway came up and a Mr. Bonnheim stated that, under the present conditions, it was practically impossible to raise $625,000 for the purchase of state highway bonds. State Treasurer Roberts gave assurance that for a bonus of $25,000, he could guarantee that $625,000 worth of highway bonds could be floated on the market to bond-buying houses. The delegation informed the commission that an active canvass would be commenced at once, and that as soon as the $25,000 was subscribed, the matter would be taken up with the State Treasurer and the commission would be advised of the fact.

On December 31, 1913, the commission met with a group from Alameda County regarding the matter of constructing a series of experimental sections of state highway in that county. The commissioners informed the delegation that they would join with the supervisors of Alameda County in such experimental tests and would apportion from the state highway funds a pro rata of from $8,000 to $10,000 per mile for such work. This would be done only with the understanding that the supervisors or private persons or corporations would furnish additional funds necessary for such experimental construction. It was finally decided that a state highway of 16,000 feet, divided into lengths of about 1,000 feet each, would afford ample room to test at least 16 different kinds or types of highway construction. The supervisors were prepared to assure the commission that the extra funds necessary for the experimental tests were available and they would have a further meeting sometime in January.

(To Be Continued)

In Memoriam

HOMER P. BROWN

Following a lengthy illness which caused him to resign as a member of the California Highway Commission on October 26, 1951, Homer P. Brown died in San Francisco on November 24th. He was appointed to the commission by Governor Earl Warren on September 14, 1943.

Mr. Brown was general manager of the Diamond Springs Lime Company located at Diamond Springs, El Dorado County, near Placerville. He was an active member of the El Dorado Chamber of Commerce, of which he was a director, and chairman of the Industries Committee of the Sacramento Valley Council of the California State Chamber of Commerce. He was also a director of the Mother Lode Highway Association.

He was a member of the Sutter Club of Sacramento and of the Bohemian Club of San Francisco.

Mr. Brown was born in Butte County July 4, 1878, ond was engaged in the sugar industry for 21 years.

He went to El Dorado County about 1927 and built the plant of the Diamond Springs Lime Company, which he owned and operated.

Mr. Brown is survived by his widow, Eva; a daughter, Mrs. Phyllis Fout of San Francisco; a sister, a granddaughter and two great granddaughters.

Bonneroo Stag

District VII Construction Department Presents Trophy

By H. R. KRIEGH, Associate Highway Engineer

In District VII, Los Angeles, the Construction Department, Division of Highways, held its "First Annual Bonneroo Stag," on the evening of September 12, 1952.

Trophies were presented to the resident engineer and contractor who turned out the best job completed in District VII during 1951.

Stanley Ball, of N. M. Ball Sons, the contractor on the best contract, and Herb Belford, the resident engineer, received trophies, which were miniature Galion, tandem gold-plated rollers, mounted on varnished hardwood bases having golden plates on which their names, the name of the contract, and the reason for the award, were engraved. Certificates, signed by state officials and bearing a State of California Seal, were presented to Chet Orcutt, the superintendent for N. M. Ball Sons, and to the state personnel, who were instrumental in obtaining the best contract. W. L. Fahey, District Engineer, and F. B. Cressy, Assistant District Engineer, made the presentations.



Trophy presented to contractor N. M. Ball Sons at first annual Bonneroo Stag. Resident Engineer awarded similar trophy.

Contractors Speak

Stanley Ball, spokesman for N. M. Ball Sons, thanked the state employees and told how his father, founder of the firm, had instructed his sons "if you cannot do it right, it is better to leave it undone." He was followed by Orcutt, his superintendent, Ray Cahoon from Basich Brothers, Joe Porcher from Griffith Company, Vido Kovacevich from Vido Kovacevich Company, Neal Saul from J. E. Haddock, Ltd., Al Mecham from M. S. Mecham and Sons, Jack Kasler from Fredericksen and Kasler, Cox Brothers Construction Company, and Lee Boettig from Warren Southwest, the contractors on the ten best contracts.

Belford, in his acceptance speech, thanked N. M. Ball Sons for their good work and gave the credit for the award to his assistants. He was followed by other resident engineers who were on the ten best contracts and by the assistants who received certificates: C. A. Brallier, Jr., J. A. Coffey, R. E. C. DeLaney, H. J. Downs, F. L. Everitt, C. A. Galloostian, L. S. Higley, Richard Jones, W. M. McKnight, H. F. Meinke, K. P. Mock, J. L. Nausler, C. I. Palmer, Ralph Palmer, H. T. Peasnall, Henry O. Salberg, E. R. Smart, C. N. Wilczek, and Ira K. Zipperman.

Play Presented

Two hundred engineers and contractors were present, and were served a dinner, preceding the awards, by ladies of the Old Dixie's staff. After the awards, a play, "Una Día Typical En La Officina? Del Ingeniero Residente," written by Resident Engineer C. E. Dresser, was presented by Construction Department personnel. The high light of the play—when McCarty (Jack Smith), one of the inspectors who fouled up on the job, was sentenced to the District Office Design Department by Resident Engineer Pinchpenny (K. D. Lewis), shot himself as he left the field office—brought down the house.

Cressy Originates Ceremony

The year the first contracts were completed under the expanded program brought about by the Collier-Burns Act, a District VII Field Supervising Engineer asked Cressy one afternoon in the fall of 1948: "Which job would you say was the best?"

"Several of our jobs this year have been 4.0, but I would have to make a study before I could point definitely to the best," Cressy ducked a direct reply to the question. From that moment on, however, he turned over in his mind a plan by which every resident engineer would know how his completed project stood.

When he was back in his office again Cressy instructed the author to fix up a form for rating the jobs. These forms were to be given to the Field Supervisors and one was to be filled out and turned in to the office at the end of each completed project. The form was prepared as follows:

Each contract was divided into its main phases of work; grading, structures, subgrade, paving, curbs and gutters, finishing roadway, and any others which required close supervision and inspection. Items for safety, treatment of the traveling public, and complexity were added. The engineering cost was also given consideration. The field supervisors were instructed to use four words in rating the phases of the work: excellent, good, fair, and below average.

Reports Are Graded

At the end of the year the reports were graded by Cressy and his staff with numerical grades. Each phase of work was weighted. The old Navy numerical system was used, 4.0 for excellent, etc. The score obtained was divided by the score which could have been obtained had all phases been rated excellent, which gave a fraction usually from 0.99 for the best jobs down to as low as 0.60 for the ones which were not so good.

O. K. From Headquarters

When Headquarter's Office received the first report of the ratings for the calendar year 1949, the district was given the go ahead signal to continue the procedure for the next years ahead, and was promised the benefit of the use of Headquarter's roughometer for rating the pavement smoothness. The roughometer has proven to be a great help and has frequently been the deciding factor in separating two contracts which tied for first place.

"Why not present a trophy to the winner?" Robert Innis, one of the younger members of Cressy's staff, offered the suggestion in question form one day early in 1952.

"Say, you may have something there," Cressy approved, but left the question open for discussion. "What would you suggest?" Several ideas were presented and at last the present trophy was decided upon because the tandem roller to engineers is symbolic of smoothness.

"How would you suggest that we make the presentation?" Cressy asked his head man, Evan Bower, one morning at the round table. (The round table is the group which gathers in the office before working hours to hear the latest yarn.)

"I think we should have a party."

"What kind of party?" Cressy asked.

"That should be put to a vote of the field men," Bower replied.

Vote for Stag Party

"OK, get out a questionnaire and whatever the vote shows make the necessary arrangements."

The questionnaire was prepared and sent out. The resulting vote was almost two to one in favor of a "stag" party.

Not long afterward Cressy and Bower were inspecting Camp 37 and the portion of the Big Pine road under construction by prison labor. One of the foremen was talking to Camp Superintendent Harry Johnson about job assignments.

"Joe Dokes will like that; he will think that is bonneroo," the foreman said after Harry had told him what he had lined up for Joe.

"Say that again," Cressy smiled, for he thought his ears were hearing things or a new word had been added to the dictionary. "Bonneroo," Harry Johnson repeated the word for the foreman, "that means he will like the job."

"Say that gives me an idea," Bower joined in, "I'm going to call our party 'Bonneroo Stag'." And thus came about the presentation party and ceremonial which was described at the start.

The word "bonneroo" is a slang and colloquial pronunciation of the French

. . . Continued on page 51

Ten Best Contracts

A list of the 10 best contracts in each of the years 1949, 1950 and 1951 is given below together with the names of the resident engineers and contractors:

1949

Contractor	Description	Resident Engineer
1. Griffith Company	Santa Ana Freeway, Soto to Eastman	Basil Frykland
2. Peter Kiewit Sons' Co.	Hollywood Freeway, Vineland to Barham	H. E. Belford
3. Schroeder & Co.	Alameda Ave., Victory to West City Limits, Burbank	C. E. Dresser
4. Vido Kovacevich Co.	Lakewood Blvd., Beverly to Bellflower	F. E. Sturgeon
5. Peter Kiewit Sons' Co.	Ridge Route, Los Alamos Creek to 2.3 miles S. Route 59	R. E. Deffebach
6. Peter Kiewit Sons' Co.	Ventura Blvd., 1.6 miles E. to 1.6 miles W. of Malibu Junction	R. V. Chase
7. Clyde W. Wood, Inc.	Coast Hwy., Seacliff to Mussel Shoal	A. W. Carr
8. M. S. Mecham & Sons and Boddum & Peterson	Valley Boulevard, San Bernardino Road to Route 26	H. Ayanian
9. J. E. Haddock, Ltd.	Sepulveda Blvd., Playa St. to East City Limits, Culver City	C. C. French
10. Jesse S. Smith	Arroyo Seco Parkway, Bartlett St. to Figueroa Terrace	L. E. Steele

1950

1. Peter Kiewit Sons' Co.	Santa Ana Freeway, Rosecrans to Orange County Line	Basil Frykland and A. W. Carr
2. C. O. Sparks & Mundo Engr. Company	Firestone Blvd., Central to Ivy	R. A. Collins
3. Sully Miller Contr. Co.	Huntington Beach Blvd., Garfield, 23d St.	C. J. McCullough
4. Vido Kovacevich Co.	San Fernando Rd., Pacoima to Sayre	F. E. Sturgeon
5. Griffith Company	Coast Hwy., El Rio to Oxnard	M. F. Masters
6. Griffith Company	Route 4, Burbank Blvd. to San Fernando Rd.	Roy M. Cooley
7. J. E. Haddock, Ltd.	Rosemead Blvd., Beverly to Garvey	F. A. Read
8. Vido Kovacevich Co.	Foothill Blvd., Shamrock to Huntington Dr.	D. J. Faulkner
9. Griffith Company	Anaheim-Telegraph, Hoefner to A. T. & S. F. Ry.	C. E. Dresser
10. Baker & Pollock	Coast Hwy., North City Limits to South City Limits, Oxnard	M. F. Masters

1951

1. N. M. Ball Sons	Hollywood Freeway, Virgil to Glendale	H. E. Belford
2. Basich Bros., W. C. LeFever and D. Gerald Bing	Ridge Route, Castaic Creek to Palomas Wash	R. E. Deffebach and F. E. Sturgeon
3. N. M. Ball Sons	Hollywood Freeway, Glendale to Grand	Haig Ayanian
4. Griffith Company	Hollywood Freeway, Western to Virgil	John Ritter
5. Vido Kovacevich Co.	Rosemead Blvd., Valley to Garvey	Roy M. Cooley
6. J. E. Haddock, Ltd.	Ramona Freeway, Evergreen to Helen Dr.	Basil Frykland
7. M. S. Mecham & Sons	Lakewood Blvd., Carson to Center	L. W. Sixt
8. Fredricksen & Kasler	Ventura Blvd., 2 miles E. of County Line to 1 mile W. of Moorpark Rd.	M. F. Masters
9. Cox Bros. Const. Co.	Coast Hwy., Seascout Base to South City Limits, Newport Beach	D. J. Faulkner
10. Warren Southwest, Inc.	Coast Hwy., Vermont to Figueroa	C. C. French

DISTRICT VIII OFFICE BUILDING IS COMPLETED

By RUSSELL J. STANDING, District Office Engineer

A THREEFOLD enlargement of the State Division of Highways Office in San Bernardino is completed and occupied by all departments.

A $500,000 building program has been carried on for nearly two years with the addition of a two-story reinforced concrete office wing on the easterly side and a smaller one-story addition to the rear. A complete remodeling of the existing structure to harmonize with the new addition has produced a very pleasing appearance.

The completion of the building has enabled the state agency to bring all its activities under one roof at the headquarters at 247 Third Street, just east of Arrowhead Avenue, in San Bernardino.

Crowded Conditions

For the past 10 years the district forces have been handicapped because of crowded conditions. Some offices

UPPER LEFT—Excavation started on new building April 17, 1951. In background is old building and to left is one of three Army-type buildings used by district personnel since World War II. UPPER RIGHT—June 13, 1951. Ready to wrap up basement section of east wing. LOWER LEFT—Front view of ivy clad old building that has been completely remodeled inside and is still the main entrance. LOWER RIGHT—Completed building. Built of heavy reinforced concrete on wide foundations, it is virtually earthquake proof.









have been located in rented quarters in the business district, while others have been compelled to occupy Army-type buildings on the headquarters grounds. This great increase in the State's highway program in the last few years has brought out the need for additional space.

The building is an old California mission style structure with reinforced concrete walls and red tile roof. The outer wall finish is a cream-colored stucco. Such details as a series of arches bordering the cloister and ornamental iron gates at the entrances to the cloister and patio serve to beautify the exterior. This style of architecture is monumental to the early history of the spot, the building being near the site of the old fort and stage depot established by the Mormon pioneers who settled the valley.

Design of Building

In plan the building is L shaped, the lobby and private offices being included in the leg of the L and the bottom portion of the east wing. The main drafting rooms are on the second floor of this wing. The square portion within the L and facing the street is enclosed by a concrete wall forming a patio. A cloister along the inner side of the leg shelters the walk from the sidewalk to the main entrance which leads to the lobby in the central portion of the building.

The original building which covered approximately 5,000 square feet of floor space was completed early in 1927 at a cost of approximately $29,000. The new building covers an area of 28,000 square feet and was completed in August of this year.

The landscaping plan has been approved and it is expected that the work will be completed before the end of the current year at which time an "open house" is planned for the public to view the building and become acquainted with the personnel.

The general contractor on the building was the Harvey A. Nichols Company. The air conditioning and heating system was placed by Conditionaires Limited, and the electrical contract by Vancott Company, all of Los Angeles.

The general contract was for $347,614.22; air conditioning $106,646.24; electrical contract $47,403.62.

Engineering Course Is Offered by the Division of Highways

"Bituminous Pavements for Roads and Streets," is the subject of a short course currently offered to engineering personnel of the Division of Highways and others in various parts of the State.

Jointly sponsored by the Institute of Transportation and Traffic Engineering and the Engineering Extension Division, both of the University of California, the course is being given in 12 cities throughout the State during the winter and spring. The opening presentation was held in San Bernardino on October 17th and the last session is scheduled for next April in Bishop.

The course consists of four 3-hour meetings held on successive week ends in each of the cities. Among the topics presented are: types of bituminous pavements, construction operations, significant properties of bituminous mixtures, factors influencing selection of bitumens, field sampling of materials, testing of aggregates and bitumens, preparation of bituminous mixtures and kinds and significance of tests and mixtures.

Besides San Bernardino, the course has already been given in Redding, San Diego and Berkeley. The remaining cities where the course will be held and the opening dates are: San Luis Obispo, December 12th; Los Angeles, January 9th; Stockton, January 23d; Fresno, February 13th; San Jose, March 6; Eureka, March 20th; Marysville, April 3d, and Bishop, April 17th.

Bonneroo Stag

Continued from page 49 . . .

words "bonne rue" which mean, literally translated, good street, but which are used by laborers and others to express their satisfaction as to their job assignment; i.e., a soft job is "bonneroo." The words take on a more significant and expressive meaning as used for the name of this social function and suggest more nearly the original meaning "good street" or a "good highway" ceremonial.

In Memoriam

LAWRENCE T. ROBINSON

Lawrence T. Robinson, Highway Superintendent on the maintenance staff of District IV, Division of Highways, passed away at the Permanente Hospital in Oakland after a short illness.

Larry, as he was known by all his friends and acquaintances both within and outside the state organization, had numerous distinctive qualities desired by many and possessed by few—his principal quality being to carry out to perfection any assignment given him. The vacancy left by him in the district organization is one that will be difficult to fill and his years of association with us will be long remembered.

Larry was born in Jamestown in the Mother Lode country on January 23, 1904, and was one of a family of seven boys and four girls. He completed grammar school in Jamestown and his high school education at Sonora, the county seat of Tuolumne County.

Immediately after his graduation from high school he started to work for the old California Highway Commission as laborer and was promoted progressively to graderman, truck driver, mechanic helper, subforeman, and highway foreman, all in Districts III and X, before transferring to District IV in 1935, upon promotion to Highway Superintendent.

Larry's tenure in District X was primarily in the Sonora area, with short periods of time at Rio Vista, Sacramento and Merced.

His first assignment in District IV was the highway superintendency at San Jose, one of the heavier maintenance sections, which he held until 1948 when he was reassigned to the Hayward territory, for a short period, and in the same year was assigned to the District Office to handle liaison work regarding maintenance functions between the State Division of Highways and the 66 cities in the district.

During Larry's assignment in the Sonora area he met Miss Clyde Fuigett of Sacramento, and they were married in Reno in 1927.

River Road

Critical Kiesel Crossing on Sacramento-Woodland Route Doomed

By R. E. STICKEL, District Office Engineer

Hazards and inconveniences caused by inferior alignment and substandard sight distance together with increased maintenance costs due to inadequate depth of base and surfacing were responsible for the initiation of a project currently under way on the Sacramento-Woodland River Road between one-half mile north of Kiesel and two miles south of Kiesel, road III-Yol-50-E,F (State Sign Routes 16 and 24).

The highway on which this project is located is a direct connection between Sacramento and Woodland. It is the shortest vehicular thoroughfare from Sacramento to Woodland and points north and west of Woodland. For a long period all classes of traffic between Sacramento and Woodland and points north have used it, but since October in 1949, when a load limit was established through the City of Davis, it has become an increasingly important route for heavily loaded trucks. A substantial portion of the truck traffic is local in nature, stemming from the fact that there is considerable farm-to-market transport of sugar beets, rice, hops and garden truck raised on the rich, agricultural lands in the Sacramento River bottom.

Kiesel Crossing

After the project under way is completed, three hazardous locations will have been improved. The first and most critical location under revision by the current contract is marked by the point where the highway crosses the Sacramento Northern Railway tracks. At this point, known as Kiesel Crossing, the highway ascends abruptly from the valley floor to follow along the crest of the river levee. A summit vertical curve restricts sight distance here. The sharp curvature of 175-foot radius is not compensated for by superelevation due to the fact that a flat transverse section at the railroad tracks is mandatory. Limited clearance lines of the railroad make extensive use of guardrail and guideposts for roadway delineation an impossibility.



This aerial photo shows the realignment on the Sacramento-Woodland Road. Existing alignment is on left and the new one is shown on the right in this picture.

The second hazardous location is 0.3 mile north of the crossing, where the highway skirts a former railroad spur and station grounds. This spur has long since been removed and the area has more recently been occupied by a large advertising sign. To the traveling public the only visible reason for the circuitous alignment was to avoid this sign.

Inferior Alignment

The third location, 0.6 mile south of the crossing, is another instance of inferior alignment, in this case due to the highway's location on the crest of the winding levee which borders the Sac-

ramento River and parallels the meandering stream. This location is most hazardous from the traffic safety standpoint at night. To the night driver the appearance of headlights ahead gives the illusion of the road continuing straight ahead from levee top to levee top instead of twisting on short-radius curvature to right or left.

With poor visibility aggravated in foggy weather conditions due to glaring headlights the probability of mishap is increased. At this third location a road approach which is used by an adjacent farm ramps up sharply from ground level to the road grade atop the levee. Vehicles entering the highway are not visible from the road until they pull out on the edges of the traveled lane. With loaded trucks pulling on and off the highway, especially during harvest seasons, conditions for safe travel are unfavorable.

Traffic Accidents

Traffic accident studies at Kiesel Crossing for the period January, 1946, to July, 1950, provide the following information: 42 people were injured; five were killed. Forty-two of the accidents were single car accidents, while 17 involved two or more cars. Six of the accidents occurred under wet weather conditions; 53 occurred during the dry. Twenty of the accidents occurred at night; 39 occurred during the day. Speeds on the route in general run, from observation, between 45 and 50 miles per hour for the larger part of the normal traffic despite the fact that safe speeds of 25 miles per hour or less should not be exceeded at several points, including Kiesel Crossing. The traffic accident profile shows that the majority of the accidents occurred at the crossing. The lack of sight distance in the flat section at the railroad crossing which normally would be superelevated causes many eastbound vehicles to fail to negotiate the curve and go off the road down the steep levee slope. None of the accidents involved trains.

In addition to deficiencies from the traffic safety standpoint deterioration in the pavement due to the heavy volume of traffic indicated that extensive reinforcement of base and surfacing was imminent.

Reason for Location

Examination of the project led to fixing the crossing at its present location, providing a better angle and grade at the intersection, and increasing reversing curve radii there to figures of 800 feet and 1,200 feet. Inferior alignment 0.3 mile north and 0.6 mile south of the crossing was eliminated. Grade rates at the crossing will not exceed 1.5 percent. A factor considered in maintaining the highway alignment at its present location at the crossing was the necessity of retaining in place a large, concrete pump house which otherwise would have had to be reconstructed at some nearby location. The end of the project was fixed approximately two miles south of the crossing in order to extend the limits of improved pavement over areas badly in need of patching and reinforcement. No special warning devices were deemed justified at the improved crossing due to the moderate amount of rail traffic. Rail traffic, on the average, amounts to only one train each way per day during daylight hours and one each way approximately every two months after dark.

Nearing Completion

Arrangements were made by the State for the contractor to secure imported borrow material from the overflow area lying between the existing highway and the Sacramento River. This area is under water during the winter season. In order to minimize the scour in the river bottom it was required in the contract provisions that transverse strips 25 feet in width, including the existing brush and standing timber, should be left in place at 800-foot intervals in the borrow area.

On the new alignment the typical cross section will consist of 24x0.25 foot plant-mixed surfacing on 0.67-foot untreated rock base and 0.67-foot subbase material. The 4-foot shoulders will consist of 0.25 foot tapering to 0.13 foot of plant-mixed surfacing on untreated rock base and imported subbase.

The contract for this project was awarded to A. Teichert and Sons, Inc., Sacramento, June 10, 1952. Work was begun July 11, 1952, and will be completed in December. Mr. Edward F. Silva, Jr., represents the State as resident engineer.

BOMBAY'S EXPERIMENT IN THE NATIONALIZATION OF ROAD TRANSPORT

California Highways and Public Works is in receipt of a copy of *State Transport Review*, the monthly publication of the Bombay State Road Transport Corporation. It is a special supplement to mark the completion of four years of Bombay's nationalized road transport.

India's first great experiment in nationalization of road transport has been carried on under difficult conditions. What has been accomplished is noteworthy.

Editor Joseph John of the *State Transport Review* has turned out an informative and valuable special issue. —*Editor.*

NETHERLANDS WATCHES STATE HIGHWAY WORK

For many years highway engineers in the Netherlands have been interested in California highway and bridge construction. How closely they follow the outstanding progress in this State is indicated in the July, 1952, issue of *Wegen*, a publication devoted to highways and published in Amsterdam. In this issue the editors of *Wegen* summarize nine articles which appeared in the January-February issue of *California Highways and Public Works.*

The articles were Epic Battle, by N. R. Bangert, dealing with the snow removal on mountain highways last winter; Santa Ana Freeway, by W. L. Fahey; Hollywood Freeway Through Los Angeles, by R. C. Kennedy; Ramona Freeway, by B. N. Frykland; Ridge Route Reconstruction as Freeway, by C. P. Montgomery; U. S. 99 Job, by W. M. Nett; New State Highway Through Placerville, by J. F. Lipp; Street Sweepers, by N. H. Heggie, and Orinda Slide, by E. W. Herlinger and Gifford Stafford.

POPULATION OF NEW MEXICO

The population of New Mexico showed an increase of 28.1 percent between the years 1940 and 1950, according to the National Automobile Club. The population in the 1950 census was 681,187.

STATE ROUTE 28 IN MENDOCINO BEING REALIGNED



These photographs, by Caterpillar Tractor Co., were taken on Contractor Arthur B. Siri's job just southeast of Boonville, California, on State Route 28, in Mendocino County.

The contract, involving 33,500 yards of dirt, is for realigning 1.3 miles of the highway to eliminate a section of crooked road. The new road will be 35 feet wide, including shoulders.

COMMISSION MEETS WITH CIVIC LEADERS



The California Highway Commission, holding its regular September meeting in San Francisco, together with members of State Highway Engineer George T. McCoy's staff, toured the San Francisco freeway system as guests of the Chamber of Commerce of that city. A luncheon at Yacht Harbor followed the trip.

The tour of the freeways being built in San Francisco started at 9 a.m., September 17th, from Highways Building in San Francisco and included a trip through the new Broadway Tunnel. The bus, carrying the group, was the first commercial vehicle allowed through the new tunnel.

At the luncheon, short talks were given by W. P. Fuller III, President of the San Francisco Chamber of Commerce; Leonard Mosias, Chairman of the Highway Committee of the Chamber, and Frank B. Durkee, Director of Public Works and Chairman of the California Highway Commission.

This photo was taken at the luncheon, which was attended by many civic leaders and officials of San Francisco.

BRITISH COLUMBIA INTERESTED

DEPARTMENT OF PUBLIC WORKS
Langford Sign Shop, Langford, V.I., B.C.

California Highways and Public Works

DEAR SIRS: Re your official journal, *California Highways and Public Works*, I would very much like to be placed on your mailing list. I have found your publication of great interest and much help to me.

Having been at the recent University of California Institute of Transportation and Traffic Engineering Short Course on Traffic Engineering, and I. T. E. annual meeting, I met California Division of Highways personnel and they told me of the availability of the journal, and of its usefulness.

My address is as follows: J. H. Harding, Traffic Engineer, B. C. Public Works Department, Station Road, Langford, B. C., Canada.

Yours truly,

J. H. HARDING
Traffic Engineer

Huge Slide on Sign Route 1 South of Lucia

By P. L. DITO, District Maintenance Engineer, District V

THAT PORTION of scenic Sign Route 1 between Carmel and San Simeon, first opened to traffic in June of 1937, has been subject to many slides of various intensities during past winter seasons. However, this year on August 14, 1952, in the middle of the vacation and tourist season, a major slide occurred necessitating closure of the road for a period of approximately six weeks.

The slide which occurred at this time was on a portion of State Sign Route 1, approximately three-fourths mile south of Lucia, at which point the highway is constructed on the bluffs and parallels the shoreline. The major movement of the slide extended from the shoreline, which is approximately 150 feet below the road, to the top of the ridge approximately 550 feet above the roadway. The length of the movement was approximately 800 feet. A break developed at the north end of the movement wherein the pavement settled approximately 12 inches, however no break or settlement was ever observed across the roadway at the south limits.

This major movement however was not the immediate concern or the reason for closing the road. There was also a secondary movement which developed at a higher elevation and extended along a shallow surface from 300 feet to 550 feet above the road. This slow movement of the weathered material above the roadway caused a large number of rock fragments to fall and roll down the slope ricocheting onto and across the highway.

The secondary movement above the slide was very slight up until July 21, 1952, the date of the heavy earthquake in this section of the State. At that time the movement appeared to accelerate and it was necessary to place flagmen and use bulldozers in continuous clearing of the roadway of rocks and boulders.

This operation became so hazardous to the workmen that it was necessary to close the road and to unload, reslope and bench the upper portion of the slide. This was accomplished by four D-8 tractors and 'dozers working from the top of the slide down, in which all material, of necessity, was pushed into the roadway section.



UPPER—General view of slide area during unloading operations.
LOWER—Bulldozers re-establishing road at base of slide.

No Detour Possible

The ruggedness of the terrain prohibited any detour construction and any relocation of the highway would not only be extremely costly but would require a length of time greatly in excess of the time required to unload the slide.

After the top portion of the slide had been unloaded it was then necessary to remove all of the material from the roadway. In performing this task the roadway was shifted slightly toward the ocean utilizing the slide material to construct the new embankment. A trench was then constructed on the right side of the roadway as a protection from falling rocks or slide material encroaching on the traveled way.

The highway was again opened on September 18, 1952, and during the period between August 15th and September 18th, approximately 200,000 cubic yards of slide material was moved.

THIS IS ONE FISH THAT DIDN'T GET AWAY!

When Edward S. Gripper, known to all his old friends as Ned, retired from service with the State Division of Highways, making his home in South Laguna, he said he was going fishing. And Ned, as the accompanying photograph conclusively proves, is a man of his word!

The day when Ned caught the 146-pound marlin started at 2.30 a.m. August 31, 1952, when Mrs. Gripper roused Ned out for hot cakes and coffee so that he could be on hand with his neighbor, Mr. Gillespie, to start their deep sea fishing trip from Balboa at 4 a.m. They left with Capt. Lloyd Lobel of the 28-foot cabin cruiser *Babs*, prepared to go after either albacore or marlin. They sailed due south and when about 12 miles off Dana Point the two fishermen, Ned and his neighbor, switched from the feathers they were using for albacore to flying fish, in the hope of attracting marlin.

About 9.30 a.m. both Mr. Gillespie and Ned at the same instant had vigorous strikes. They allowed the two marlins to take out some 250 yards of line before throwing the drags and setting the hooks. The two marlins then began to jump out of the water close together, indicating that the lines had crossed. They jumped completely out of the water several times, and then suddenly Mr. Gillespie's line parted. Ned's line held, and after a struggle of 34 minutes he was able to bring the exhausted marlin into the boat. A marlin nine feet long and weighing 146 pounds presents many difficulties in gaffing and loading into a small boat, but all these were successfully overcome.



Ned Gripper on left and Captain Lloyd Lobel an right

Then Ned got to thinking over what he would do with his marlin. He was somewhat appalled at the prospect of cleaning and cutting up so much fish. When he was told at the Balboa Angling Club that the Lark Ellen Home for Boys at Azusa would welcome a gift of fish, this looked to Ned like a good solution to his problem and arrangements were made for his fish to go to the home.

Fish Given to Home for Boys

The Lark Ellen Home for Boys, located on 18 acres of land in Azusa, has eight buildings, swimming pool, playground facilities, and everything necessary to give a healthy, outdoor life to underprivileged boys between the ages of 10 and 16 years who, through no fault of their own, have been denied the proper home environment.

The Lark Ellen Home for Boys has been the major project of the Los Angeles Lions Host Club since 1923. The history of the home goes back to the early 1890's, when the world famous concert and opera singer, Mme. Ellen Beach Yaw, established a home for newsboys as an inducement to them to stay off the streets. Mme. Yaw was given the name "Lark Ellen" by the late General Harrison Gray Otis, then publisher of the Los Angeles *Times*.

The staff of the home consists of 15 members, headed by Superintendent Carl Miller, and they now are taking care of 60 boys. In telling about the gift of the marlin from Ned Gripper, Mr. Miller said:

"When the fish arrived in the delivery truck, the boys all gathered around bug-eyed and assisted the kitchen staff in cleaning the fish and cutting it up into steaks and chunks for the deep freezer. We have had several wonderful fish dinners and have just used up the last pieces from the deep freezer. We are now in the market for another fish!"

Bids for Prestressed Bridge Opened

Bids for construction of California's first prestressed concrete bridge designed for heavy highway traffic, which will be constructed at Weber Avenue in the City of Fresno, were opened in Sacramento on November 19th.

The structure will carry traffic southbound on Weber Avenue over US 99. The only other prestressed structure in the State is a pedestrian bridge across the Arroyo Seco in Los Angeles.

Thomas Construction Company of Fresno was low bidder with a proposal of $91,363.90.

FROM SYDNEY

THE COUNCIL OF THE CITY OF SYDNEY
City Engineer's Department

SYDNEY, N.S.W.

GEORGE T. McCOY, ESQ.,
Sacramento, U.S.A.

DEAR MR. McCOY: During my visit to America in 1947 it was my privilege to spend some time in the State of California and to meet you and other members of your division.

Since that time you have been good enough to forward regularly to me copies of your official journal *California Highways and Public Works*, a publication which has proved to be of practical use to me and to my staff, a service which is much appreciated.

With every good wish,

Yours sincerely,

A. H. GARNSEY
City Engineer

CORNERSTONE CEREMONY MARKS COMPLETION OF ANNEX TO PUBLIC WORKS BUILDING IN SACRAMENTO

On thursday, October 23, 1952, the marble cornerstone of the annex to the Public Works Building at Twelfth and O Streets in the City of Sacramento was placed and grouted in its position as an integral part of the reinforced concrete structure.

The first of the five major contracts required for building the annex was dated June 16, 1950, and work was started on July 3, 1950. The building cost approximately $3,300,000 to complete.

The ceremony marking the laying of the cornerstone was informal in nature as the building serves as an annex to the Public Works Building at Twelfth and N Streets which has been in use for 15 years and for which the cornerstone was laid on June 4, 1936, in a formal ceremony by Earl Lee Kelly, Director of Public Works and the Honorable Frank F. Merriam, Governor of California at that time.

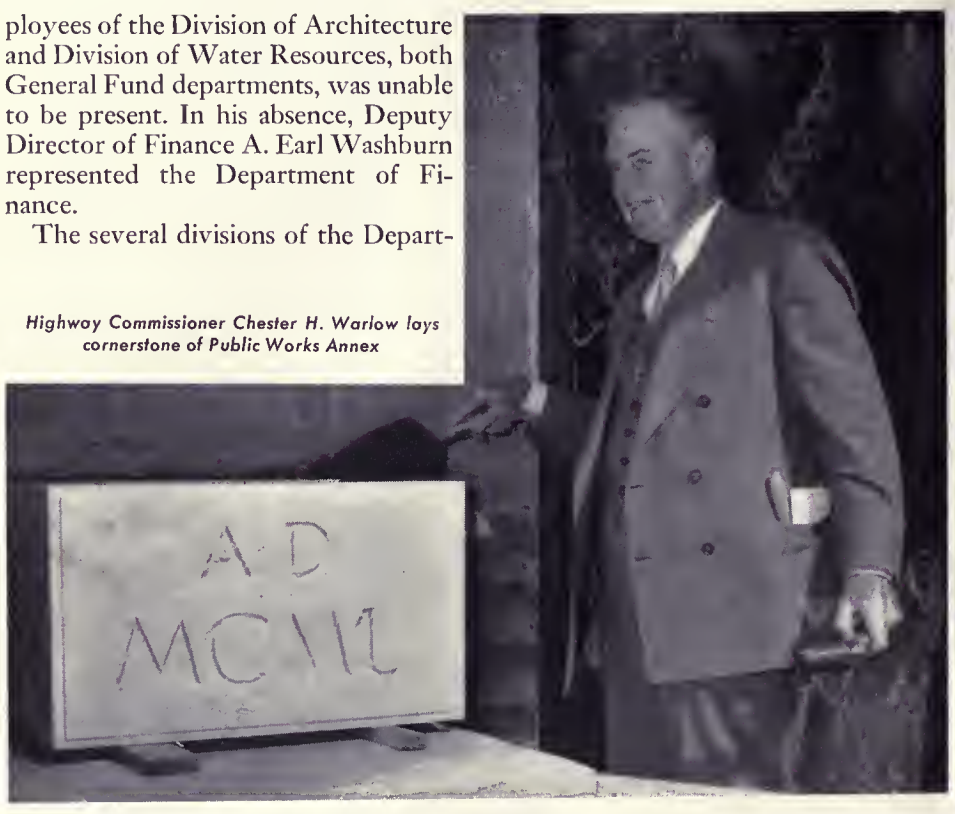
Frank B. Durkee, present Director of Public Works and Chairman of the California Highway Commission, was presiding officer for the ceremony of laying the cornerstone and Chester H. Warlow of Fresno, member of the California Highway Commission and Past Grand Master of Masons of California, performed the duty of laying the stone.

Other members of the Highway Commission who were present at the ceremony included: Harrison R. Baker of Pasadena, James A. Guthrie of San Bernardino, H. Walter Sandelin of Ukiah, Charles T. Leigh of San Diego, H. Stephen Chase of Sacramento, and the commission's secretary, R. C. Kennedy.

Unfortunately, the Honorable Earl Warren, Governor, could not be present as he was absent from the State. The Governor was represented by M. F. Small of his secretarial staff.

James S. Dean, Director of Finance, who was particularly interested as portions of the annex will house some employees of the Division of Architecture and Division of Water Resources, both General Fund departments, was unable to be present. In his absence, Deputy Director of Finance A. Earl Washburn represented the Department of Finance.

The several divisions of the Department of Public Works and other state departments were represented by their respective chiefs as follows: G. T. McCoy, State Highway Engineer and Chief of the Division of Highways; Anson Boyd, State Architect, under whose direction the annex was designed and constructed; A. D. Edmonston, State Engineer and Chief of the Division of Water Resources; Robert E. Reed, Chief of the Division of Contracts and Rights of Way; and A. H. Henderson, Director of the Department of Motor Vehicles.



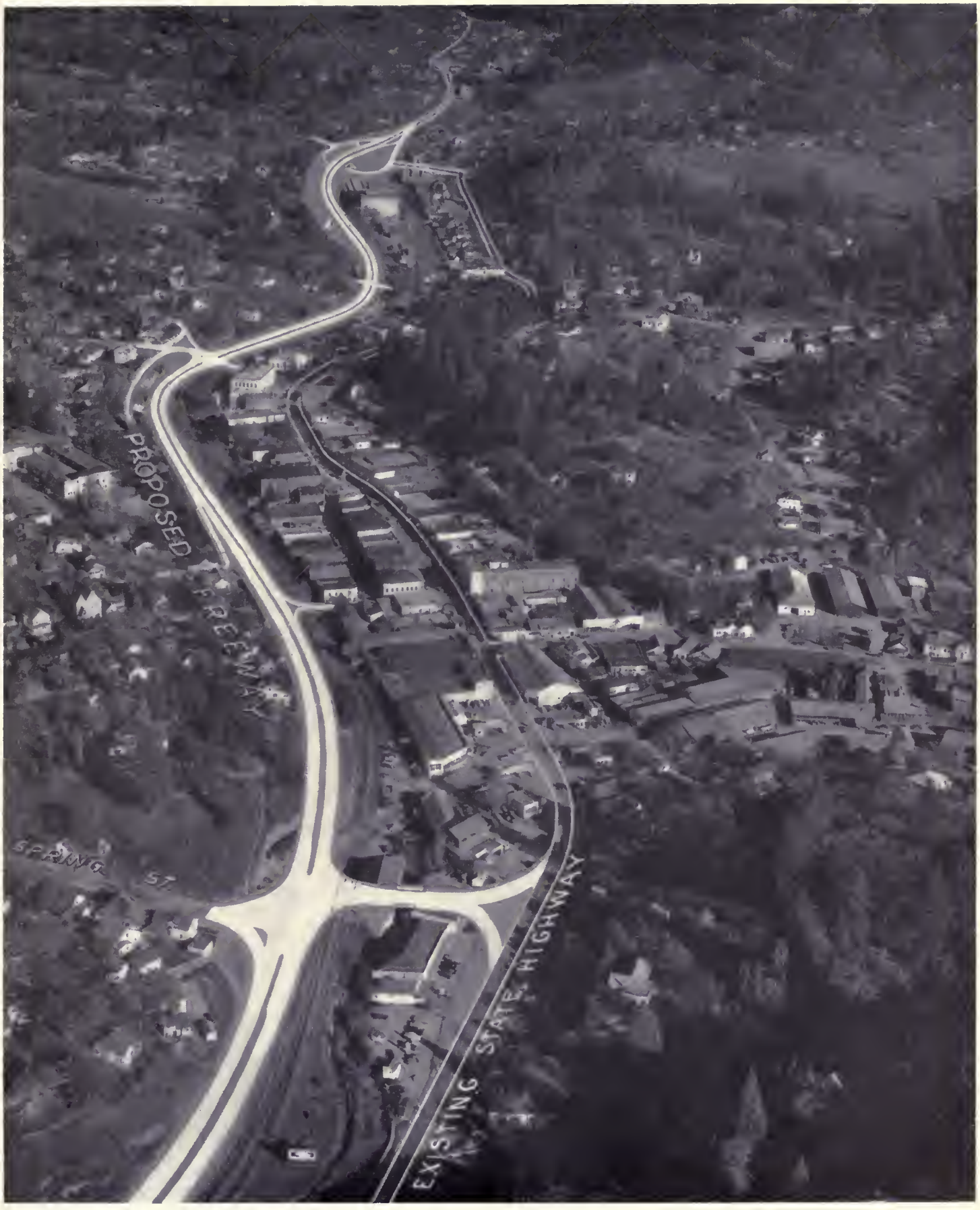
Highway Commissioner Chester H. Warlow lays cornerstone of Public Works Annex

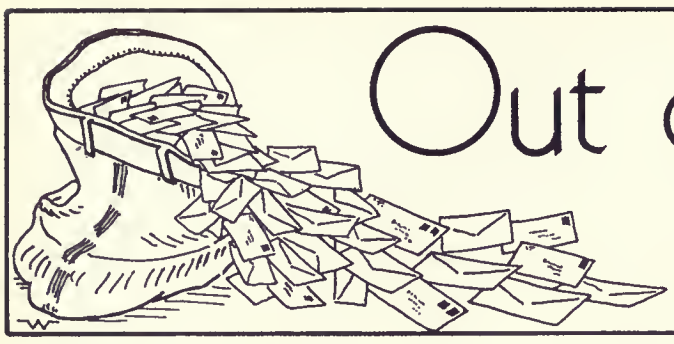
25 Years With Right of Way Department

On August 31st, George Pingry completed 25 years with the California State Highway Right of Way Department.

On September 1, 1927, Pingry joined the State Highway Department as district right of way agent for the Fresno district. In 1933 he was transferred to San Diego to take charge of the right of way department of the then newly created District XI. After 12 years in the border city, he moved north to become district right of way agent for the San Francisco metropolitan area. Two years later he was promoted to assistant chief right of way agent, the position he now holds.

The aeriol photograph on the opposite page shows the line of the existing State Highway, US 50, and proposed freeway through Placerville, El Dorado County. In the 1953-54 budget of the California Highway Commission there is on allocation of $595,000 for the second construction unit of the freeway, which calls for grading and structures for a length of 1.5 miles. There is also an item of $250,000 for additional right of way through Placerville.


PROPOSED FREEWAY
SPRING ST
EXISTING STATE HIGHWAY



Out of the Mail Bag

FROM AUSTRALIA

By PETER MANTLE

AWAY from the towns and cities in Australia, thousands of miles of roads are made, maintained, and improved, by gangs of workmen who live on the job in well-run hutted camps.

Australia, with a population fewer than 8,500,000 has about 500,000 miles of roads. A substantial part of the continent is very thinly populated and has virtually no roads. But there is still a big area served by roads remote from the places in which the roadmakers have their homes. To take the men out daily to the jobs from their city homes, or even from the regional depots, would involve far too much traveling time. So they live on the job in camps that can be easily packed up and moved to new sites when the work is finished.

Hutted camps and canvas camps for road workers are used in all six states of Australia. Most gangs are highly mechanized. There are few pick-and-shovel men and most of the workers are drivers of some piece of earth-moving equipment.

In the State of Victoria, for instance, about 2,000 men are employed by the Country Roads Board on road making, road maintenance, and bridge construction. The board owns and operates 2,000 items of road making and bridge building equipment. These are additional to the substantial number of privately owned motor trucks whose drivers work on a contract basis.

Victoria, one of the smaller but most highly developed states, has 3,850 miles of state highways, 432 miles of tourist roads and 375 miles of forest roads. For all of these the Country Roads Board pays the entire cost of construction and maintenance. Then there are 9,800 miles of main roads which are generally under the care of municipalities, and 90,000 miles of unclassified roads and streets.

The Country Roads Board gets its income from motor registration fees (about $8,500,000 a year) and from that part of the petrol tax collected by the Australian Commonwealth Government which is returned to the state. The principle of using a petrol tax for financing roads works is generally regarded as a fair one. Fuel used by a road vehicle is a measure both of the miles run and the load carried, so the operator of the vehicle, in paying a fuel tax, contributes in accordance with the use that he makes of the road system.

City roads are, of course, made sufficiently strong to take continuous heavy traffic. But in the country there is neither the need nor the money for such heavy construction. The general basis for road construction is judged by the average number of vehicles using the road. If they expect only five vehicles a day, it is sufficient to grade the existing surface. When there are 50 vehicles a day, road-making authorities add a three-inch layer of gravel. Sealing with bitumen is warranted when there are 200 vehicles a day. And when the number rises to anything over 2,000 a day, a higher class pavement is used.

Much of the sealing with bitumen surface is done by men working from tented camps. The work can only be done satisfactorily in the warmer weather between October and April. So early in summer the gang starts out from a main depot with its trucks, sprayers, bitumen heaters, camping gear, and mobile kitchen, to go out for a few months on the road. Generally they live in tents so that they can pull down their camp, move 50 miles along the road, and re-erect their camps, all within a day. They have collapsible seating forms and tables, a mess hut or tent, a mobile kitchen completely fitted out, and small water tanks that are carried in motor trucks.

AUSTRALIAN NEWS & INFORMATION BUREAU
West Coast Office:
206 Sansome Street, San Francisco 4

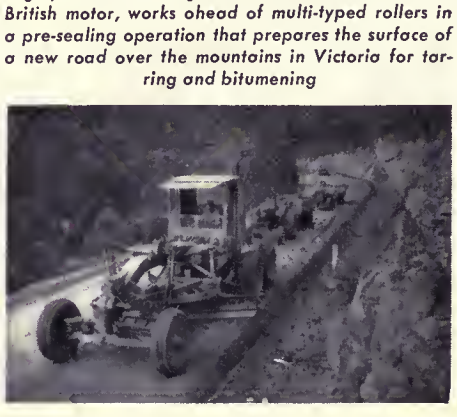
MR. KENNETH C. ADAMS,
Editor, "California Highways and Public Works"

DEAR MR. ADAMS: I have been sending my copy of *California Highways and Public Works* to our head office in Australia after reading it. The office has been very interested in the publication and has prepared a story on road building in Australia which it suggests you might consider using in your publication. I am sending the story to you in the hope that it will prove of sufficient interest for publication.

Yours sincerely,

NORMAN MCRAE
West Coast Representative

High-powered road grader built in Australia with British motor, works ahead of multi-typed rollers in a pre-sealing operation that prepares the surface of a new road over the mountains in Victoria for tarring and bitumening



Out on the job a construction gang first grades the road, using power graders to remove any irregularities in the surface. A mechanical broom cleans the surface of dust and loose gravel. Then the center of the road is marked to guide the man driving the sprayer. Meanwhile the tar and the bitumen have been heated in oil-fired heaters. The primary spraying of tar is allowed to soak in, and then comes the bitumen spray which is followed by an automatic spreader that puts an even layer of stones on the surface, to be pressed in and consolidated by motor rollers.

Men driving rollers earn $28 for a five-day week of 40 hours. Tractor drivers and grader drivers get $42. The few men who do general laboring work get a camping allowance of two shillings a day which brings their wages up to $27 a week. Overtime is paid for at time-and-a-half for the first two hours, and double time after that. In the ordinary run of events Saturday and Sunday are holidays, though drivers are paid overtime rates for weekend or after hours maintenance work on their machines.

The Country Roads Board provides all kitchen equipment and pays the wages of a cook and his "offsider" (assistant). The men of a gang form a mess committee to watch over the purchase of food and the selection of menus. They can eat at whatever standard is agreeable to them. They pay for the raw materials of their menus, and most camps eat well and heartily at a present-day (May, 1952) rate of about six shillings a day. The cook gets $31 for a five-day week and an extra $4.50 a day if he is required to cook at the weekend.

As many of the gangs include contract men who have their own motor trucks, contract plant operators and workmen can generally make arrangements to get transport down to their homes after knock-off time on Fridays, and to return on Sunday evenings. But their working week is spent in the tents or huts, with a few amenities like a recreation hut equipped with radio, and with adequate facilities for messing. In some camps the huts are fitted with electric light.

County Roads Board snowplow, driven by Patrolman "Knocky" Forester, on the "rooftop" of Victoria, keeps the Harrietville-Alpine road open



During their first three years of service men are entitled to 10 days leave each year and then become entitled to anything up to three weeks annual leave.

Road work as a whole is controlled by a chief engineer at head office. Each of the 10 roads divisions in Victoria has a supervising engineer with his engineering assistants. A gang is in the charge of an overseer who has generally worked his way up from the bottom. Then there are gangers controlling the drivers and laborers. A road-making gang is equipped with tractors fitted with bulldozer blades, power graders, front-end loaders, motor trucks, and various types of mechanical rollers for compacting. In many parts of the state they are able to use local gravel, stones, and sand, but in others materials have to be transported considerable distances.

Today when Australia has so many jobs offering in primary and secondary industry, it is difficult to find men who will undertake the rather arduous work of stone breaking after the rock has been blasted, and before it can be handled by the normal crushers. So it has been necessary to construct new crushers that can take larger boulders, as well as cranes to lift the boulders into the crushing plant.

Work on the mobile road-making gangs is hard, but there is very little sheer laboring nowadays in Australia. It is a simple life but with the amenities available it is not a rough life. And many of the men find it possible to save a substantial part of their pay. There will doubtless be further improvements in machines to make the road-makers' work easier, but for many years to come Australia, with its big area and relatively small population, will need gangs of men in their hutted camps living on the job—the job of making the life-lines of a continent.

BUNKER GETS AN "A"

5132 Woodlawn Avenue
Chicago 15, Illinois

Mr. Kenneth C. Adams, *Editor*

Dear Mr. Adams: Through the kindness of my brother-in-law, Rev. Philip D. Norvell of Paramount, California, I have the opportunity to read an occasional copy of your fine magazine. Even though I am a layman so far as highway engineering is concerned, I find your magazine very interesting, partly because I have traveled over many of the fine highways in your State, but largely because the magazine is so well edited and the articles you publish are so well written.

I wish to pay especial tribute to the article on "Roads and the Right of Way Department" by Earle R. Bunker, in the May-June issue of this year. As a former English teacher, I would give this report a high grade, if it were submitted to me as an essay in one of my classes. It is interesting, imaginative, well written, and it possesses the desirable qualities of clearness, informativeness, cohesion and conciseness. I hope I may have the pleasure of meeting the author some day. Perhaps I may, as I shall again be spending a winter in your delightful State before many years go by.

I shall look forward to other copies of your magazine which I am sure the Rev. Mr. Norvell will be sending me from time to time.

Cordially yours,
George W. Grill

APPRECIATION

California Highways and Public Works

Gentlemen: As an avid reader of your publication, I want to express my appreciation for the fine manner in which it keeps the public currently informed of highway and freeway developments in our State. It is a project which deserves the wholehearted support of all those interested in traffic control and safety.

Sincerely,
Donald K. Byrne

HIGHWAY BIDS AND AWARDS

September, 1952

ALAMEDA AND SAN JOAQUIN COUNTIES—Between 2 miles east of Redmond Overhead and Corral Hollow Road, about 7.5 miles in length to be graded and base material placed, and reinforced concrete bridges to be constructed. District X, Route 5, Sections E, A. Fredericksen & Kasler, Sacramento, $2,090,711; A. Teichert & Son, Inc., Sacramento, $1,794,206.30; Frederickson Bros., Emeryville, $1,764,362; Lord & Bishop & M. J. B. Construction Co., Sacramento, $1,763,534.25; H. Earl Parker, Inc., & Harms Bros., Sacramento, $1,745,389.80; Bressi and Bevanda Constructors, North Hollywood, $1,689,806.25; Ball & Simpson, Berkeley, $1,689,668.50; Ukropina, Polich, Kral, San Gabriel, $1,656,583.30; Guy F. Atkinson Co., South San Francisco, $1,639,308.40; Fredrickson & Watson Const. Co., Oakland, $1,563,102.29; Dan Caputo & Edward Keeble, San Jose, $1,555,902.95; Eaton and Smith, San Francisco, $1,546,815.20. Contract awarded McCammon-Wunderlich Co. & C. K. Moseman, Palo Alto, $1,447,396.05.

LOS ANGELES COUNTY—On Harbor Freeway, between Olympic Blvd. and Second Street, about 1.1 miles in length to be graded and paved with portland cement concrete pavement on cement treated subgrade and 19 retaining walls and a pedestrian undercrossing to be constructed. District VII, Route 165. Bressi & Bevanda Constructors, North Hollywood, $2,279,793.75; Griffith Company, Los Angeles, $2,216,896; Ukropina, Polich, Kral, San Gabriel, $2,124,473.95; Webb and White and W. J. Disteli, Los Angeles, $1,987,337.50. Contract awarded J. E. Haddock, Ltd., Pasadena, $1,919,792.25.

SACRAMENTO COUNTY—Across San Joaquin River, about 5 miles north of Antioch, the northerly approach spans of the existing bridge to be repaired. District X, Route 11, Section C. George Pollock Co., Sacramento, $32,255; Intrusion-Prepakt, Inc., San Francisco, $28,142; Barton Construction Co. & Scheyer, El Cerrito, $23,660; Bos Construction Company, Berkeley, $22,310. Contract awarded Stanley H. Koller Construction, Crockett, $19,826.

SAN BERNARDINO COUNTY—City of Redlands at the intersections of Central Avenue with Orange Street and Beacon Street with Citrus Avenue, traffic signals and highway lighting to be furnished and installed and modified. District VIII, Routes 26, 190. Paul R. Gardner, Ontario, $14,950; Electric & Machinery Service, Inc., South Gate, $14,915; Fischbach & Moore, Inc., Los Angeles, $14,829. Contract awarded Ed. Seymour, Long Beach, $14,170.

SAN BERNARDINO COUNTY—Between Danby and Needles, 32 timber trestle bridges to be redecked with reinforced concrete slabs. District VIII, Route 58, Sections L, M. Owl Truck & Construction Co., Compton, $182,004; C. B. Tuttle, Long Beach, $180,567.50; E. G. Perham, Los Angeles, $179,542.50; Norman I. Fadel, North Hollywood, $173,482; Pike & Hill, Carey Bros. & Bailey, San Rafael, $160,218.10; Young & Smith Construction Co., Salt Lake City, Utah, $156,884. Contract awarded E. S. & N. S. Johnson, Fullerton, $153,532.

SAN DIEGO COUNTY—In Palm City, at 18th Street and Palm Avenue, a reinforced concrete box culvert to be constructed and the roadway surfaced with plant-mixed surfacing, and a detour to be constructed. District XI, Route 199, Section A. Nielsen Construction Co., San Diego, $24,942.85; Einer Bros., Inc., Escondido, $21,879. Contract awarded Griffith Company, Los Angeles, $17,192.78.

SAN LUIS OBISPO COUNTY—Between Pismo Beach and San Luis Obispo, about 4.7 miles in net length, existing pavement and shoulders to be surfaced with plant-mixed surfacing and a seal coat applied. District V, Route 2, Section E. Madonna Construction Company, San Luis Obispo, $107,160; Granite Construction Company, Watsonville, $96,350; M. J. B. Construction Co., Stockton, $92,920. Contract awarded Valley Paving Company, Pismo Beach, $83,353.

SAN MATEO COUNTY—City of Redwood City, at the intersections of Bayshore Highway with Whipple Avenue, and with Chestnut Street—Harbor Blvd., full traffic-actuated signal system and highway lighting to be furnished and installed and channelization to be constructed. District IV, Route 68. Peter Sorensen, Redwood City, $52,890; Underground Elect. Construction Co., Oakland, $50,963.50; R. Flatland, San Francisco, $47,036. Contract awarded L. C. Smith Co., San Mateo, $45,955.

SANTA BARBARA COUNTY—In the City of Santa Barbara, at Salinas Street intersection, about 0.1 mile cross-over and channelization to be graded and surfaced with plant-mixed surfacing on untreated rock base. District V, Route 2. Contract awarded to Baker & Pollock, Ventura, $17,453.75.

SANTA CLARA COUNTY—Between Peebles Avenue and Madrone Underpass, about 0.4 mile, existing pavement to be widened with plant-mixed surfacing on cement-treated base and imported base material. District IV, Route 2, Section B. J. Henry Harris, Berkeley, $29,196.50; Granite Construction Co., Watsonville, $23,827; A. J. Raisch Paving Co., San Jose, $20,494.25. Contract awarded Leo F. Piazza Paving Co., San Jose, $17,943.06.

SANTA CLARA AND ALAMEDA COUNTIES—Between Route 68 at Gish Road and Warm Springs, about 8.1 miles to be graded and paved with Portland cement concrete pavement on cement-treated subgrade, and with plant-mixed surfacing on various types of base material, and grade separation structures to be constructed. District IV, Routes 69, 5; Sections A,E,C. Parish Bros., Benicia, $2,895,101.25; Peter Kiewit Sons' Co., San Francisco, $2,824,968.85; McCammon-Wunderlich Co. & C. K. Moseman, Palo Alto, $2,688,903.08; Guy F. Atkinson Co., South San Francisco, $2,676,090.75; Fredrickson & Watson Construction Co.-M. & K. Corporation, Oakland, $2,590,450.65; Carl N. Swenson Co., Inc., and Ball and Simpson, Berkeley, $2,579,122.80; B. J. Ukropina, T. P. Polich & Steve Kral, San Gabriel, $2,573,015.70. Contract awarded Granite Construction Co., Watsonville, $2,529,391.

SISKIYOU COUNTY—Between Yreka and Montague, about 5.9 miles in net length, portions to be graded, placing imported base material on portions, cement treating and upper portion, surfacing with road-mixed surfacing, and constructing a reinforced concrete bridge across Yreka Creek. District II, Route 82. Pike & Hill, Carey Bros. & Bailey, San Rafael, $290,609.40; Eaton & Smith, and Clements & Co., San Francisco, $266,152.80; Fredrickson & Watson Construction Co., Oakland, $259,858.80. Contract awarded Harms Bros., Sacramento, $236,781.50.

SOLANO COUNTY—Protective screen planting between Cordelia Underpass and Ledgewood Creek, District X, Routes 7, 8, Sections H, B; A. Stephen L. Vistica, San Mateo, $8,508.60; Watkin & Sibbald, San Anselmo, $8,373; Huettig, Schromm & Bennett, Inc., Palo Alto, $8,009.30; Diablo View Gardens, Antioch, $7,226.15; Dana R. Tyson Co., Sacramento, $7,045.10. Contract awarded Justice-Dunn Co., Oakland, $6,792.10.

STANISLAUS COUNTY—Cleaning and painting a bridge on State highway in Stanislaus County across Tuolumne River, about 2.5 miles west of La Grange. District X, Route 110, Section E. John P. McGuire, San Jose, $11,200; J. S. Morris Co., Berkeley, $8,870; Klaas Bros., Los Angeles, $12,830. Contract awarded R. W. Reade & Co., Berkeley, $7,060.

TULARE COUNTY—For furnishing and installing traffic signal system and highway lighting in Tulare County, City of Visalia, at the intersection of Mineral King Avenue with Giddings Avenue. District VI, Route 10. Wilbur D. Stieers Electric, Visalia, $11,996.45; Robinson Electric, Fresno, $9,910; Westates Electric Construction Co., Los Angeles, $8,835. Contract awarded L. H. Leonardi Electric Construction Co., San Rafael, $8,280.

TULARE COUNTY—Across Tule River at south city limits of Porterville, a reinforced concrete bridge to be repaired. District VI, Route 129, Section B. Friant Construction Company, Fresno, $12,213. Contract awarded Volpa Bros., Fresno, $12,003.

TULARE COUNTY—Between Bartlett Park Road & Clavicle, about 6.5 miles in length to be widened with plant-mixed surfacing on imported base material and drainage structures to be extended. District VI, Route 127, Section B. Gordon H. Ball & San Ramon Valley Land Co., Berkeley, $105,301.55. Contract awarded C. F. Oliphant, Hanford, $99,973.50.

F. A. S. County Routes

NEVADA COUNTY—About 9 miles north of Nevada City, between State Highway Route 25 and 3.3 miles east, about 3.3 miles in length to be graded, imported sub-base material and imported base material to be placed and bituminous surface treatment to be applied. District III, FAS Route 765. Paul E. McCollum & C. L. Cypber, Richmond, $99,379.40; Clements & Co., Hayward, $97,927; Harms Bros., Sacramento, $93,050; J. Henry Harris, Berkeley, $86,129; Huntington Bros., Napa, $84,920; H. Earl Parker, Inc., Marysville, $76,872.20; Lefever & Bing, West Sacramento, $76,122; Joe Chevreaux, Auburn, $68,726.40. Contract awarded Elmer J. Warner, Stockton, $66,548.20.

ORANGE COUNTY—On Bristol Street and Palisades Road, between Delhi Road and MacArthur Blvd., about 4.3 miles in net length, to be graded and surfaced with plant-mixed surfacing on untreated rock base and bituminous surface treatment to be applied to untreated rock base on the shoulders. District VII, FAS Route 1182. Clyde W. Wood & Sons, Inc., North Hollywood, $313,285.64; Griffith Company, Los Angeles, $266,871.25; J. A. Thompson & Son, Contractors, Inglewood, $255,275.70; R. J. Noble Company and R. J. Noble, Orange, $246,167.55. Contract awarded Sully-Miller Contracting Co., Long Beach, $237,405.

SANTA CLARA COUNTY—On San Jose-Stevens Creek Road, between Saratoga-Sunnyvale Road and Orange Avenue, about 1.2 miles in length, additional roadway widths to be graded and plant-mixed surfacing to be placed over imported base material, bituminous treated imported base material and existing pavement. District IV, FAS Route 1000. McCammon-Wunderlich Co., Palo Alto, $179,012.05; J. Henry Harris, Berkeley, $171,968.34; L. C. Smith Co., San Mateo, $158,016.41; A. J. Raisch Paving Co., San Jose, $146,395.05; Edward Keeble, San Jose, $142,501.30. Contract awarded Leo F. Piazzo Paving Co., San Jose, $128,596.75.

October, 1952

ALAMEDA COUNTY—On Hesperian Boulevard, at San Lorenzo Creek, a steel girder bridge to be constructed and about 0.15 mile of approaches to be graded and surfaced with plant-mixed surfacing on crusher run base. District IV, Route 69, Section B. D. M. Sandling, San Pablo, $104,837.50; J. Henry Harris, Berkeley, $84,150.25; Chas. S. Moore & Robert R. Murdoch, Oakland, $79,099.50; Stolte, Inc., Oakland, $78,198; Wheeler Construction Company, Oakland, $76,965.05; Bos Construction Co., Berkeley, $74,981; Dan Caputo, San Jose, $68,237.05. Contract awarded Fredrickson & Watson Construction Co. & M & K Corp., Oakland, $62,809.44.

ALAMEDA COUNTY—Between Fallon and Market Streets, about 1 mile in length, undercrossings and retaining walls to be constructed, portions of a freeway to be graded, surface ramps and city streets to be graded and to be surfaced with plant-mixed surfacing on cement treated base or crusher run base, and highway lighting and traffic signal systems to be installed. District IV, Route 69. Charles L. Harney, Inc., San Francisco, $1,289,144.20; Fredrickson & Watson Construction Co., M & K Corp., Oakland, $1,229,840.35; Stolte, Inc., & Gallagher & Burk, Inc., Oakland, $1,208,990. Contract awarded Ball & Simpson & Erickson, Phillips & Wiseberg, Berkeley, $1,196,231.70.

ALAMEDA COUNTY—Eastshore Freeway at Hegenberger Road, about 0.5 mile in length, to be graded and surfaced with plant-mixed surfacing on crusher run base. District IV, Route 69. J. Henry Harris, Berkeley, $69,849.85; Fredrickson & Watson Construction Co., Oakland, $66,666.66; Independent Construction Co., Oakland, $64,697.70. Contract awarded Gallagher & Burk, Inc., Oakland, $62,359.30.

ALAMEDA COUNTY—On Eastshore Freeway, between High Street and 38th Ave., about 0.3 mile in net length of roadside areas to be prepared and planted; a watering system to be installed; cut slops are to be stabilized; and bituminous penetration treatment is to be applied. District IV, Route 69. McGuire & Hester, Oakland, $89,487.71; J. Henry Harris, Berkeley, $53,788.85; Watkin & Sibbald, San Anselmo, $46,957.12; Huettig, Schramm & Bennett, Inc., Palo Alto, $44,528.29; Justice-Dunn Co., Oakland, $40,918.02. Contract awarded Stephen L. Vistica, San Mateo, $38,458.70.

ALAMEDA COUNTY—From Alvarado Road to East City Limits of Berkeley, on Tunnel Road, plant mix surfacing and install guard railing. District IV, Route 206. O. C. Jones & Sons, Berkeley, $12,397. Contract awarded J. Henry Harris, Berkeley, $11,718.

CONTRA COSTA COUNTY—At Pine Creek, about 1.1 miles southwest of Concord, a reinforced concrete box culvert to be constructed and plant-mixed surfacing placed over crusher run base. District IV, Route 75, Section B. Friant Construction Co., Fresno, $17,672; J. Henry Harris, Berkeley, $17,399; Bos Construction Co., Berkeley, $17,262.50; Al Erickson & Co., Napa, $17,133. Contract awarded Wheeler Construction Co., Oakland, $15,790.75.

FRESNO COUNTY—Portions between 4 miles east of Cove Road and White Deer Road, about 6 miles in net length, to be graded and surfaced with plant-mixed surfacing on cement treated base, and construct a reinforced concrete slab and girder bridge across Mill Creek. District VI, Route 41, Section T. Hess Construction Co., Inc., Long Beach, $847,561; Harms Bros., Sacramento, $831,676.60; Gordon H. Ball & San Ramon Valley Land Co., Berkeley, $796,371.30; Guy F. Atkinson Co., South San Francisco, $795,407.10; Fredericksen & Kaiser, Sacramento, $793,185; H. Earl Parker, Inc., Marysville, $792,411.35; Ukropina-Polich-Kral, San Gabriel, $783,955.10; Fredrickson & Watson Construction Co., Oakland, $735,745.90. Contract awarded Eaton & Smith, San Francisco, $732,384.10.

HUMBOLDT AND SONOMA COUNTIES—Across Eel River, south of Scotia; and across Russian River at Guerneville, two existing steel bridges to be repaired. District I, Routes 1 and 104, Sections E, B. Laredon Construction Co., Hollywood, $25,775. Contract awarded Bos Construction Co., Berkeley, $21,594.75.

IMPERIAL COUNTY—Across Valerie Wash about 7.3 miles south of Riverside County Line, a reinforced concrete slab bridge to be constructed. District XI, Route 26, Section E. Geo. W. Peterson & Jack W. Baker, Los Angeles, $46,260; E. G. Perham, Los Angeles, $25,908; Norman I. Fadel, North Hollywood, $25,301; C. B. Tuttle, Long Beach, $25,254. Contract awarded W. J. Disteli, Los Angeles, $25,228.50.

IMPERIAL COUNTY—Across Araz Wash, 6.3 miles west of the Colorado River Bridge at Yuma, Arizona, about 0.2 mile in length of detour to be graded and surfaced and a reinforced concrete bridge to be constructed. District XI, Route 27, Section B. Sooy and Jackson and Marks Bros. Construction Co., Redlands, $74,127.25; C. B. Tuttle, Long Beach, $66,993.50; Young & Smith Construction Co., Salt Lake City, Utah, $66,519; Norman I. Fadel. North Hollywood, $61,764.50. Contract awarded Laredon Construction Co., Los Angees, $61,364.50.

IMPERIAL COUNTY—Across the Holtville Main Drain, 9.2 miles north of Holtville, a reinforced concrete bridge to be constructed and a detour to be graded and bituminous surface treatment applied. District XI, Route 187, Section B. Laredon Construction Co., Los Angeles, $69,483; Sooy & Jackson and Marks Bros. Construction Co., Redlands, $65,552.78; Basich Bros. Construction Co., N. L. Basich & R. L. Basich, Garvey, $64,503.50. Contract awarded O. B. Pierson, Bellflower, $56,884.50.

LOS ANGELES COUNTY—At the intersections of Foothill Boulevard with Rosemont Avenue and with Briggs Avenue, traffic signal systems and highway lighting to be furnished and installed. District VII, Route 9, Section A. Harry F. Brewer, Long Beach, $14,306; Fischbach and Moore, Incorporated, Los Angeles, $13,332; Electric and Machinery Service, Inc., South Gate, $12,960; C. D. Draucker, Inc., Los Angeles, $11,263. Contract awarded Westates Electrical Construction Co., Los Angeles, $10,892.

LOS ANGELES COUNTY—On Santa Ana Freeway, between Lakewood Boulevard and Pioneer Boulevard, highway lighting and illuminated sign systems to be furnished and installed. District VII, Route 166, Section A. Westates Electrical Const. Co., Los Angeles, $38,992. Contract awarded Newbery Electric Corporation, Los Angeles, $35,117.

LOS ANGELES COUNTY—At the intersection of Manchester Boulevard with Inglewood Avenue, and with Grevillea Avenue, traffic signal system to be furnished and installed and traffic signal system to be modified. District VII, Route 174. C. D. Draucker, Inc., Los Angeles, $6,605; Fischbach & Moore, Incorporated, Los Angeles, $6,054; Electric and Machinery Service, Inc., South Gate, $5,887; Harry F. Brewer, Long Beach, $5,367. Contract awarded Westates Electrical Construction Co., Los Angeles, $4,599.

LOS ANGELES AND ORANGE COUNTIES—At the intersections of Valley Boulevard with Third Avenue; Carson Street with Woodruff Avenue in and adjacent to the City of Long Beach; and Orangethorpe Avenue with Lemon Street, full traffic-actuated signal systems and highway lighting to be furnished and installed. District VII, Routes 170, 178, 175, Sections B, A, B. Electric and Machinery Service, Inc., South Gate, $40,120; Westates Electrical Construction Co., Los Angeles, $33,896; Ed. Seymour, Long Beach, $31,745. Contract awarded Fischbach and Moore, Incorporated, Los Angeles, $29,660.

MENDOCINO COUNTY—In Russian Gulch State Park, a reinforced concrete slab bridge to be constructed. District I. C. C. Gildersleeve, Grass Valley, $11,480.67. Contract awarded Reed & Tuttle, Redwood Valley, $9,830.

ORANGE COUNTY—Between Pacific Coast Highway in Newport Beach and 20th Street in Costa Mesa, about 1.9 miles in length, to be graded and surfaced with plant-mixed surfacing on cement treated base over imported subbase material. District VII, Route 43, Sections Npt. B, A. Griffith Company, Los Angeles, $752,216.50; Cox Bros. Construction Co., Stanton, $741,685; A. Teichert & Son, Inc., Sacramento, $716,779. Contract awarded Sully-Miller Contracting Company, Long Beach, $716,033.40.

ORANGE COUNTY—On Placentia-Yorba Road, between Esperanza Road and Route 43, a reinforced concrete bridge to be constructed and about 0.6 mile in length to be graded and surfaced with plant-mixed surfacing on untreated rock base. District VII, Route 176, Section A. Tumblin Company, Bakersfield, $338,810; Norman I. Fadel, North Hollywood, $311,226; Charles MacClosky Company, San Francisco, $282,839.50; Webb & White, Los Angeles, $278,144.20; Hubbs Equipment Co. & Bakker Construction Co., J. V., Colton, $263,844.30; Fredericksen & Kasler, Sacramento, $258,470.92; O. B. Pierson, Bellflower, $256,027.26. Contract awarded J. A. Thompson & Son, Contractors, Inglewood, $243,254.

RIVERSIDE COUNTY—At Palo Verde Lagoon, at West C Canal and at C-03 Canal, a reinforced concrete bridge to be constructed, reinforced concrete pipe siphons to be installed, and about 0.6 mile of roadway to be graded and surfaced with road-mixed surfacing. District XI, Route 146, Sections A, B. E. G. Perham, Los Angeles, $111,113; Norman I. Fadel, North Hollywood, $92,486.50; E. F. Grandy, Laguna Beach, $91,971.40. Contract awarded Sooy & Jackson and Marks Bros. Construction Co., Redlands, $80,065.25.

SACRAMENTO COUNTY—City of Sacramento, at the intersections of Folsom Boulevard with Alhambra Boulevard, 34th Street, 36th Street, 39th Street, 47th Street, 51st Street, 55th Street, and 59th Street, traffic signal systems and highway lighting to be furnished and installed and modified. District III, Route 11. Collins Electrical Co., Sacramento, $38,753; Underground Electric Construction Co., Oakland, $35,597; Luppen & Hawley, Inc., Sacramento, $31,080.37; R. Goold & Son, Stockton, $29,995; Reliable Elevator Works, Sacramento, $29,938. Contract awarded L. H. Leonardi Electric Construction Co., San Rafael, $28,121.

SAN BERNARDINO COUNTY—City of San Bernardino at the intersections of Mount Vernon Ave. with Mill St., Rialto Ave., Second St., and Fourth St., and Second St. with Viaduct Blvd.; traffic signal systems and highway lighting to be furnished and installed and channelization to be constructed. District VIII, Route 31. Westates Electrical Const. Co., Los Angeles, $50,803; Fischbach and Moore, Incorporated, Los Angeles, $49,983; Paul R. Gardner, Ontario, $49,688.56. Contract awarded Drury Electric Co., San Bernardino, $46,702.25.

SAN BERNARDINO COUNTY—In the City of Upland, between Euclid Avenue and East City Limits, about 1.3 miles in length, the roadbed to be widened and resurfaced with plant-mixed surfacing. District VIII, Route 190, Matich Brothers, Colton, $32,557. Contract awarded George Herz & Co., San Bernardino, $31,622.90.

SAN DIEGO COUNTY—Between Buena Vista Creek in Carlsbad and Monterey Drive in Oceanside, highway lighting to be furnished and installed. District XI, Route 2, Sections Cbd, Ocn. California Electric Works, San Diego, $48,630. Contract awarded Ets-Hokin & Galvan, San Diego, $47,343.

SAN DIEGO COUNTY—In the City of San Diego, between Park Boulevard and Texas Street, about 0.5 mile in length, to be surfaced with plant-mixed surfacing. District XI, Route 12. V. R. Dennis Construction Co., San Diego, $29,477.50; Daley Corporation, San Diego, $26,150; R. E. Hazard Contracting Co., San Diego, $26,140.90. Contract awarded Griffith Company, Los Angeles, $25,643.80.

SAN DIEGO COUNTY—In the City of San Diego on the east side of Calhoun Street, adjacent to District XI Office Building, about 0.08 mile in length, curbs and sidewalks to be constructed. District XI. T. B. Penick & Sons, San Diego, $2,328.75. Contract awarded J. B. Henry, San Diego, $2,211.

SANTA CLARA COUNTY—At the intersections of Bayshore Highway with San Antonio Road and with Middlefield Road, full traffic-actuated signal system and highway lighting to be furnished and installed and channelization to be constructed at one intersection and highway lighting to be furnished and installed at one intersection. District IV, Route 68, Sections A, P.A. E. G. Kurze Electrical Works, San Jose, $27,573.70; A. J. Raisch Paving Co., San Jose, $25,534.50; R. Flatland, San Francisco, $24,237.12; J. Henry Harris, Berkeley, $24,230.50; L. C. Smith Company, San Mateo, $23,742.50; Fields Electric Works, Santa Clara, $23,554.50. Contract awarded Howard Electric Co., Gilroy, $22,688.50.

SHASTA COUNTY—In Anderson, at the intersection of South St. and Route 3, and at the intersection of North St. and Route 3, furnish and install highway lighting systems. District II, Route 3, Section A. Shasta Electric Co., Redding, $4,357.97. Contract awarded L. H. Leonardi Elect. Const. Co., San Rafael, $2,773.

SOLANO COUNTY—Across Miner Slough, about 12 miles north of Rio Vista, a bridge to be repaired. District X, Route 99, Section A. D. M. Sandling, San Pablo, $74,648.75; Bos Construction Co., Berkeley, $74,444; Stolte, Inc., Oakland, $64,542; Barton Construction Co. & K. S. Scheyer, Oakland, $63,952; Lord & Bishop, Sacramento, $58,394. Contract awarded M. A. Jenkins, Sacramento, $54,451.

SUTTER COUNTY—At Sycamore Canal, about 3 miles west of Yuba City, bridge to be widened. District III, Route 15, Section B. C. C. Gildersleeve, Grass Valley, $20,413.16; O'Connor Bros., Red Bluff, $19,945.50; Rice Brothers, Inc., Marysville, $18,754; Wm. S. Shedd, Yuba City, $17,777; A. A. Edmondson, San Fernando, $17,529; Friant Construction Co., Fresno, $17,262. Contract awarded Al Erickson & Co., Napa, $16,576.

TUOLUMNE COUNTY—Between Moccasin Creek Road and Priest, about 3.8 miles in length, to be graded and surfaced with plant-mixed surfacing on untreated rock base. District X, Route 40, Section B. C. V. Kenworthy, Stockton, $527,418; Ukropina-Polich-Kral, San Gabriel, $466,258.50; Fredrickson Bros., Emeryville, $458,812.50; Eaton & Smith, San Francisco, $447,744; Harms Bros., Sacramento, $445,863.50; J. Henry Harris, Berkeley, $423,556.60; Transocean Engineering Corp., San Lorenzo, $418,417; Ball & Simpson, Berkeley, $416,990.85; R. P. Shea Co., Riverside, $415,762.20; H. Earl Parker, Inc., Marysville, $376,720.90. Contract awarded Paul E. McCollum & C. L. Cypher, Richmond, $335,435.80.

VENTURA COUNTY—Over the tracks of the Southern Pacific Company, Fifth Street and Route 153 at Camarillo, a bridge to be constructed and approach ramps to be graded. District VII, Route 2, Section B. Clyde W. Wood & Sons, Inc., North Hollywood, $693,276.75; Guy F. Atkinson Company, Long Beach, $628,725; Norman I. Fadel, North Hollywood, $613,115.75; FEPCO, Los Angeles, $604,680.50; Griffith Company, Los Angeles, $597,678.25; K. B. Nicholas, Ontario, $592,162.20; MacDonald and Kruse, Sun Valley, $575,627.75; Byerts & Sons & Geo. K. Thatcher, Los Angeles, $574,794.25; Carl N. Swenson Co., Inc., San Jose, $564,632.25; O. B. Pierson and P. D. Ware, Paramount, $553,970.65; Charles MacClosky Company, San Francisco, $534,859.50; J. A.

Thompson & Son, Contractors, Inglewood, $532,292.50. Contract awarded George W. Peterson & Jack W. Baker, Los Angeles, $508,613.

F. A. S. County Routes

HUMBOLDT COUNTY—Between east city limits of Eureka and 1.26 miles southeasterly, existing roadbed to be widened and surfaced with plant-mixed surfacing. District I, Route 501. Contract awarded Mercer, Fraser Co. & Mercer, Fraser Gas Co., Inc., Eureka, $32,635.

RIVERSIDE COUNTY—Between 0.6 mile south of Route 26 and Route 26 at Garnet, a railroad overhead to be constructed and about 0.6 mile in lengtb of roadway to be graded, imported base material to be placed, and portions to be cement treated and surfaced with road-mixed surfacing, and a seal coat to be applied. District VIII, Route 1178. Charles MacClosky Company, San Francisco, $194,453.45; Norman I. Fadel, North Hollywood, $192,488; Marshall, Haas, & Royce, Belmont, $187,418; George Herz & Co., San Bernardino, $183,827.40; E. F. Grandy, Laguna Beach, $169,122.90. Contract awarded Basich Bros. Construction Co. N. L. Basich-R. L. Basich, Garvey, $163,194.45.

SAN LUIS OBISPO COUNTY—On Calf Canyon-Huer Huero Road between Huer Huero-La Panza Road and 3.2 miles west, about 3.2 miles in length, to be graded and imported base material placed. District V, Route 676. Pacific Contracting Corp., Newport Beach, $158,375; C. V. Kenworthy, Stockton, $153,565; Paul E. McCallum, Richmond, $146,159.10; Valley Paving Co., Pismo Beach, $143,550; A. A. Edmonson, San Fernando, $134,787.45; John Delphia, Patterson, $124,989; Madonna Const. Co., San Luis Obispo, $123,395. Contract awarded M.J.B. Const. Co., Stockton, $102,306.

SONOMA COUNTY—On Valley Ford Cut-off, between 1.7 miles and 3.6 miles westerly of Valley Ford, about 1.9 miles in length, to be graded and imported base material placed and a seal coat applied. District IV, Route 777. Fredrickson Bros., Emeryville, $260,978.01; J. Henry Harris, Berkeley, $244,835.50; Huntington Bros., Napa, $241,774; Eaton & Smith, San Francisco, $228,695.20; John Delphia, Patterson, $227,256.60; Pike & Hill, Carey Bros. & Bailey, San Rafael, $226,931.82; A. B. Siri, Inc., Santa Rosa, $223,403.60; Brown-Ely Co., Contractors, Corte Madera, $220,292.25. Contract awarded J. R. Armstrong, El Cerrito, $217,413.69.

TULARE COUNTY—Between Farmersville and State Route 10 at Mitchell's Corner, and between Farmersville and Exeter, about 5.3 miles in lengtb, to be graded and surfaced with plant mixed surfacing on cement treated base. District VI, Routes 1136, 1143. G. W. Ellis Const. Co., North Hollywood, $371,067.50; Volpa Bros., Fresno, $329,853.60; M. J. Ruddy & Son, Modesto, $308,364.75; Clements & Co., Hayward, $279,117.50; Baun Const. Co., Fresno, $277,161.90; Gordon H. Ball & San Ramon Valley Land Co., Berkeley, $272,976.61; Griffith Co., Los Angeles, $270,276.10; Rex Sawyer & Wm. S. & Bruce F. Hogers Co., Madera, $268,448.50; Ukropina Polich-Kral, San Gabriel, $259,325.50. Contract awarded Rice Bros., Inc., Marysville, $254,879.10.

November, 1952

CALAVERAS COUNTY—Between 3.3 miles east of San Joaquin County line and 1.5 miles west of Valley Springs, about 5 miles in length, to be widened and surfaced with plant-mixed surfacing on untreated rock base. District X, Route 24, Section A. Pike & Hill, Carey Bros. & Bailey, San Rafael, $357,895.75; R. P. Shea Co., Riverside, $315,689.45; Louis Biasotti & Son, Stockton, $302,629.90; Claude C. Wood Co., Lodi, $299,712.75; J. Henry Harris, Berkeley, $296,218.40; Harms Bros., Sacramento, $289,052.25; Fredrickson & Watson Construction Co., Oakland, $279,850; Fredrickson Bros., Emeryville, $274,983.90; Munn & Perkins, Modesto, $244,622; Ukropina-Polich-Kral, San Gabriel, $237,750.10. Contract awarded M. J. Ruddy & Son, Modesto, $221,362.

SACRAMENTO COUNTY—In the City of Sacramento at Folsom Boulevard near 59th Street, for constructing a paved storage area. District III. McGillivray Construction Co., Sacramento, $15,182.50; Brighton Sand & Gravel Co., Sacramento, $12,943; A. Teichert & Sons, Inc., Sacramento, $11,923.30. Contract awarded J. R. Reeves, Sacramento, $10,162.50.

SAN FRANCISCO—At Alemany Rotary, in San Francisco, widen two-way lane ramp and relocate electroliers and illuminated sign. District IV, Route 68. Eaton & Smith, San Francisco, $10,576.50; J. Henry Harris, Berkeley, $10,207.10; Pacific Pavements Co., Ltd., San Francisco, $9,480. Contract awarded Chas. L. Harney, Inc., San Francisco, $7,897.20.

SANTA BARBARA—At Rincon Creek Culvert, about 0.15 mile east of Santa Barbara, constructing outlet apron for arch culvert. District V, Route 2, Section H. N. M. Saliba Co., Los Angeles, $23,185; Norman I. Fadel, North Hollywood, $20,610. Contract awarded to Friant Construction Co., Fresno, $14,824.50.

F. A. S. County Routes

FRESNO COUNTY—On Dickenson Avenue, between McMullin Grade and Whitesbridge Road, about 5.1 miles in length, to be graded and surfaced with plant-mixed surfacing on imported base material. District VI, Route 809. Leo F. Piazza Paving Co., San Jose, $243,505.28; Clements & Co., Hayward, $195,897; Volpa Bros., Fresno, $189,679; Thomas Construction Co., Fresno, $186,004. Contract awarded to Baun Construction Co., Fresno, $174,807.70.

THANK YOU, JUDGE

SANTA BARBARA COUNTY
Santa Barbara, California

MR. KENNETH C. ADAMS, *Editor*
California Highways and Public Works

DEAR MR. ADAMS: I have just received *California Highways and Public Works* and I wish to compliment you upon the excellence of the publication. I have been on your mailing list for a number of years and have read each copy of your publication with a great deal of interest. You and your entire staff are to be complimented upon its excellent quality.

Very truly yours,

ERNEST D. WAGNER,
Judge of the Superior Court

Old Timers Honored

Continued from page 38 . . .

Laura K. Craft, 27; Thomas H. Dennis, 36; Mrs. Viola Driver, 28; William F. Faustman, 39; Preston L. Fite, 31; Fred J. Grumm, 28; George C. Hanson, 39; Albert L. Hardy, 26; L. E. McDougal, 26; James H. Patrick, 25; Lewis W. Seymour, 32; William A. Smith, 32; R. H. Stalnaker, 36; James G. Standley, 36; T. E. Stanton, 39; Ira G. Thomas, 32; Charles E. Thorp, 32; George R. Winslow, 29.

Awards to those completing 25 years of state service during 1952 will be made later.

Industrial Freeway

Continued from page 8 . . .

of plant-mixed surfacing on cement-treated base.

Design of Freeway

Skirting the present southerly border of Pittsburg and Antioch enables the freeway to be constructed in the more sparsely populated sections over rolling terrain, thus affording flat grades and minimum curvature. The maximum grade is 3½ percent, and the total curvature is 32 degrees with a minimum radius of 3,000 feet.

An interesting feature is the depressing of the freeway below the ground surface and use of diamond type interchanges within the cities of Pittsburg and Antioch. This type of construction maintains the same relative grades of cross streets and minimizes the areas required for approach ramps, thus effecting economy in acquisition of right of way in developed sections and in construction of shorter separation structures.

The construction cost of this project, exclusive of right of way, is $2,700,000. The right of way and right of way clearance costs approximate $800,000, making a total cost for the five-mile freeway project $3,500,000, financed by state and federal-aid funds.

The work is under the general supervision of Assistant State Highway Engineer B. W. Booker, with the author as resident engineer and R. B. Neff as the Bridge Department representative on the project.

This fourth unit will complete 20 miles of the "Arnold Industrial Highway" from Muir Station at the southern outskirts of Martinez to Antioch. The first eight miles started in 1938 consists of a two-lane highway to a junction of Route 24; the remainder is a four-lane limited access freeway.

SPEED IS KILLER

Excessive speed is a sudden and brutal killer. Whenever you hurry to make an appointment, or give yourself up to the lure of that wide and open road, you are giving this killer a chance to kill you.

EARL WARREN
Governor of California

•

FRANK B. DURKEE
Director of Public Works

•

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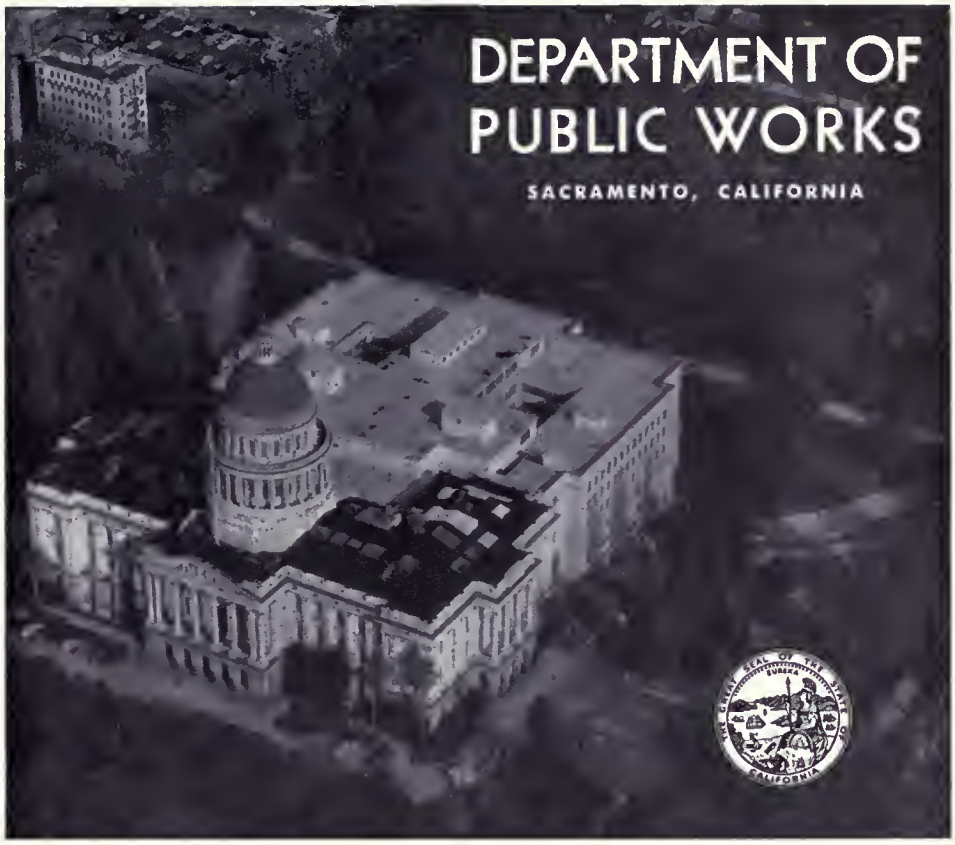
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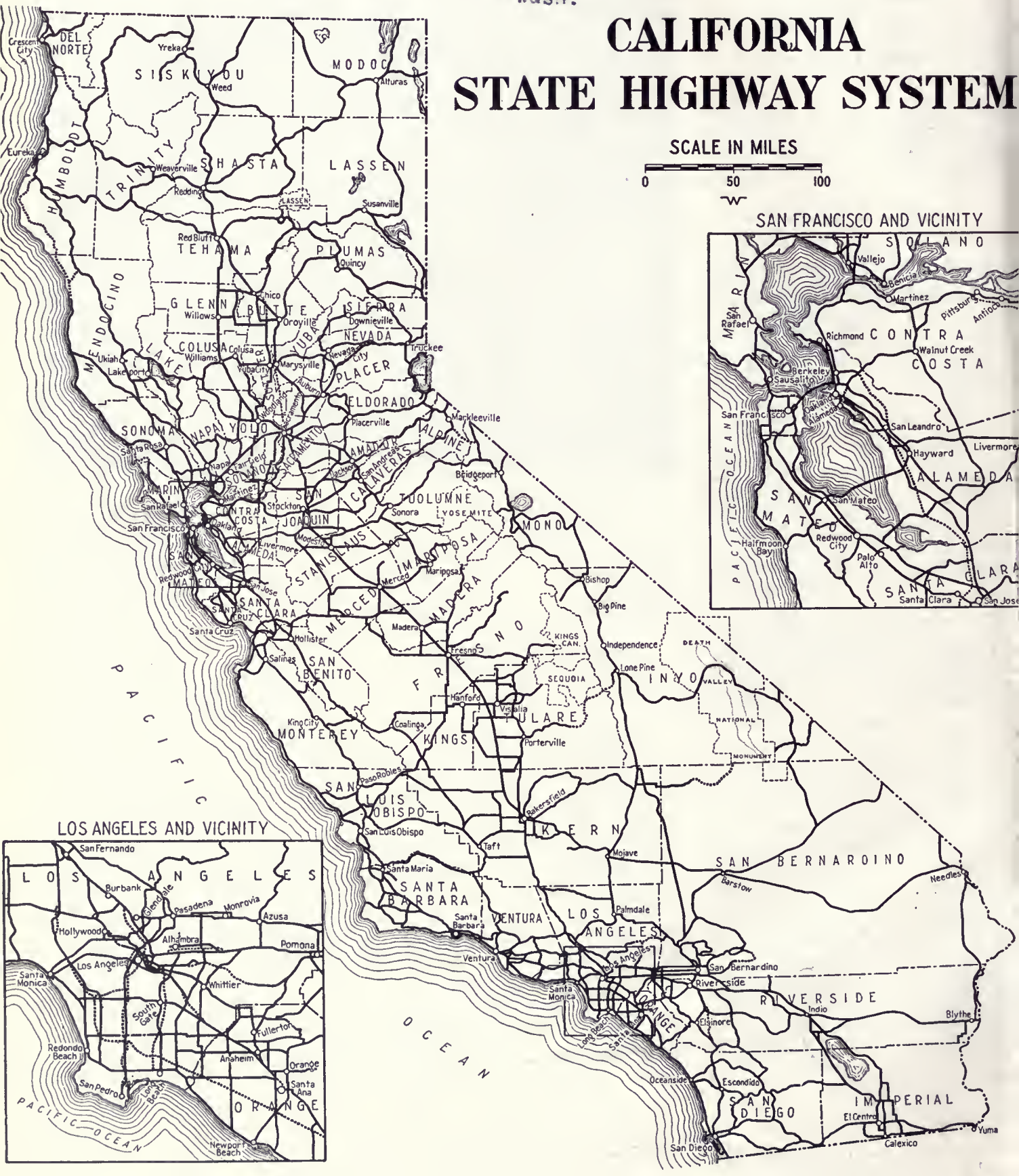
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1953

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Official Journal of the Division of Highways, Department of Public Works, State of California

FRANK B. DURKEE, *Director* — GEORGE T. McCOY, *State Highway Engineer*

KENNETH C. ADAMS, *Editor*
HELEN HALSTED, *Associate Editor*
MERRITT R. NICKERSON, *Chief Photographer*

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San Francisco Bayshore Freeway Progressing

Five Separate Contracts Now Are Under Way

By WEBB HITE, Resident Engineer, and
A. C. BIRNIE, District Budget Engineer

On June 1, 1951, the first completed unit of the Bayshore Freeway within the City of San Francisco was officially opened to traffic. That unit extends from Augusta Street to 25th Street and is 1.3 miles long.

Five separate contracts, now in progress, will extend the completed freeway from 25th Street to Seventh Street, a total length of 2.0 miles, and will include construction of an elevated connection between the freeway and Mission Street, approximately 0.7 mile long.

The Wye viaduct, which is a portion of the Division Street Interchange, is financed in the 1953-54 Fiscal Year Construction Program. It is contemplated that this project will be advertised for bids in April, 1953. The amount budgeted for construction is $1,015,000.

Millions for Project

Also financed in the 1953-54 Fiscal Year Construction Program is the portion between Hester Avenue and Alemany Boulevard, 1.7 miles long, which extends the freeway southerly from the completed portion to south of Third Street where an extensive interchange providing for a major diversion of traffic is to be provided. Advertising of this project is contemplated for early this year. The amount budgeted for construction is $3,350,000.

Only the southernmost and northernmost units of the freeway within the city remain to be financed. These are the portions between the south city limits and Salinas Avenue, 1.0 mile in length on the south, and on the north from Eighth Street to the San Francisco-Oakland Bay Bridge, 0.8 mile in length. Most of the right of way for these units has already been acquired. It is estimated that approximately $8,500,000 will be required to complete right of way acquisitions and for construction of these remaining units. Construction is contemplated as soon as limitations of financing and timing of construction will allow.

Open Water Unit

The time for construction of the unit between the south city limits and Salinas Avenue is dependent on the financing and constructing of the earth fill relocation across a portion of San Francisco Bay in San Mateo County generally referred to as the "Open Water Project." That project is of prime importance to the proper functioning of the Bayshore Freeway in eliminating severe congestion at the gateway to the city. Some construction has been done on this section in the form of experimental fills. When all units within the city are completed, there will be a six- and eight-lane freeway facility, on new location, from the south city limits of San Francisco through severely congested residential, industrial, and business areas, to the San Francisco-Oakland Bay Bridge. Adequate provisions for the expeditious, convenient and safe distribution of traffic to various destinations along the route and within the heart of San Francisco are being provided. The total construction cost will approximate $26,000,000. The cost of right of way and right of way clearance through developed areas such as this require very large expenditures in addition to the construction cost. The problems of right of way clearance are understandably complex and entail months and sometimes years of cooperative planning and negotiation with affected property owners.

Many Major Problems

Many major problems typical of freeway construction within a metropolis have been encountered on the various contracts to date. Comprehensive planning at an early date has been necessary in the acquisition of right of way and in the relocation of public utilities in order to keep construction delays to a minimum. Considerable work has been involved during construction in the removal of foundations and basements from the right of way. All types of utilities are being relocated including railroad tracks, sewer lines, water mains, power and telephone facilities. One of the most difficult being handled by contractor's forces is the relocation of the city's high pressure water lines which range in diameter from 10 inches to 20 inches and which are used only for fire prevention. The work is slow and tedious and involves careful planning as, due to serious fire hazards, the lines may be shut off for short periods only. In general, most of the utility installations have been altered by the utility company's own forces, and here again, careful planning and coordination is involved.

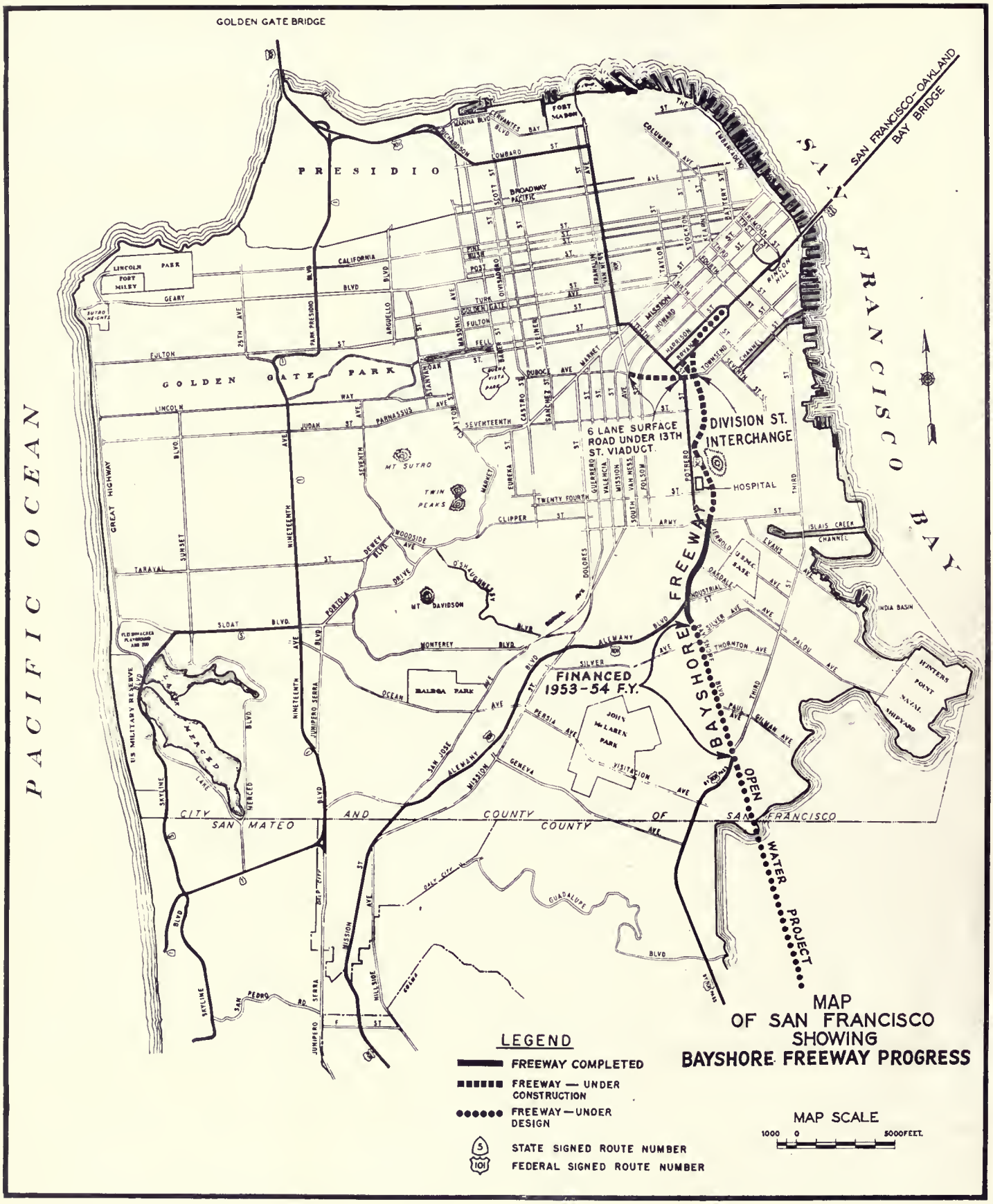
Other Units

The unit between Army Street and 17th Street is being constructed by the Fredrickson and Watson Construction Company and the M. & K. Corporation. It is 1.3 miles long and is scheduled for completion in the early summer of 1953. The construction cost will be approximately $1,600,000.

Completion of this project and opening of traffic will be coordinated with the opening of the northerly unit from 18th Street to 9th and 10th Streets at Bryant Street, thus providing the next usable unit at the same time.

Structures on this project consist of pedestrian overcrossings at 25th, 22d and 18th Streets, and a vehicular and pedestrian grade separation structure at 23d Street.

The 23d Street overcrossing is a closed abutment type structure with steel girders and a reinforced concrete deck consisting of a 42-foot roadway and two five-foot sidewalks. The nine girders required for this all-welded overcrossing consist of 50-inch by $\frac{3}{8}$-inch web plates and 16-inch by $2\frac{1}{2}$-inch



MAP
OF SAN FRANCISCO
SHOWING
BAYSHORE FREEWAY PROGRESS

flange plates. Each girder was fabricated and assembled in three sections in the shop, hauled to the site, welded together, and the full span of 124 feet lifted into position. The 42-foot concrete deck was placed in one continuous pour, the concrete being lifted into position by a truck crane direct from transit mixers.

Underdrains Constructed

Upon making field investigations during grading operations, and prior to embankment operations, considerable subsurface water was found at various locations throughout the project. This problem was overcome by placing perforated metal pipe underdrains and draining the water into the city storm drains. Approximately 1.7 miles of these underdrains were placed on this contract alone.

Northerly of 17th Street, the freeway is to be composed of elevated structures. Off and on ramps will connect to 9th and 10th Streets at Bryant Street, these streets being planned for one way traffic.

This project is being constructed by Charles L. Harney, Inc. It is approximately 0.7 mile long and the construction is estimated to cost approximately $3,000,000. It will serve traffic between the central portion of the downtown area and the freeway southerly of Division Street.

Connection with Bay Bridge

Also under construction is the unit between 17th Street and 7th Street. Guy F. Atkinson Company is the contractor. Completion is scheduled for early in 1954. Construction cost is estimated at $3,000,000. This is the northeasterly extension of the freeway toward its connection with the San Francisco-Oakland Bay Bridge approaches.

The separation of grades between the two foregoing units for the diversion of traffic to Bryant Street constitutes

View looking northerly across 17th Street showing steel superstructure under construction. Site of Division Street interchange in background.





View looking southerly showing freeway under construction between Bryant Street and Army Street in San Francisco. Steel for Ninth and 10th Streets off ramps in foreground. Portion of completed freeway visible in background.

a portion of the Division Street Interchange.

Also under construction is a unit providing for the interchange of traffic between the freeway south of Division Street and Mission Street via 13th Street (13th Street Viaduct). This unit constitutes two contracts both of which are being performed by Charles L. Harney, Inc. Completion of this unit is anticipated during the summer of 1954 and the estimated cost is $3,500,000. In addition to State work being performed on the elevated freeway, the city is reconstructing 13th Street on the ground level from a two-lane to a six-lane facility.

The Wye Viaduct

The final unit of the Division Street Interchange is the "Wye Viaduct" which is 0.2 mile long and is financed in the 1953-54 Fiscal Year Construction Program. Advertising for bids on this project is contemplated early in 1953. It provides an interchange for traffic between the 13th Street Viaduct and the freeway northeast of Division Street, toward the San Francisco-Oakland Bay Bridge.

The design and planning of the foregoing units encountered many difficult problems in the crossing of many railroad tracks, the bypassing of many large buildings, and also the avoiding of an interlocking tower at the intersection of the Southern Pacific and Western Pacific Railroads. These facilities could not be relocated and complete service was required to be maintained during construction.

The elevated structures composing these units are similar in design and consist of welded steel plate girders and stringers supported on reinforced concrete abutments and steel bents. The roadways vary from 26 feet to 50 feet in width.

The Division Street Interchange, when completed, will be the longest all welded highway overpass in the United States. These structures incor-

porate some of the methods of welding which were used on Germany's famed autobahns, but which have seldom been used in this country. The overhead structures and columns will contain no rivets. Accordingly, approximately 15 percent of the amount of steel ordinarily used is saved. Also, undetermined amounts of time and money in fabrication and erection are saved. Due to the importance of the welding, all welders are subjected to tests by the State. As a further precaution, completed welds are X-rayed so that possible defects are determined and corrected.

Major Items

An appraisal of the magnitude of the work now under way may be obtained from the following tabulation of the approximate contract quantities of some of the major items involved in the several projects now under construction.

Concrete removal	40,000 cubic yds.
Roadway excavation	442,000 cubic yds.
Structure excavation	80,000 cubic yds.
Cl. "A" portland cement concrete	33,000 cubic yds.
Structural steel	37,000,000 lbs.
Piles	210,000 lin. ft.
Reinforcing steel	4,660,000 lbs.
Misc. iron and steel	323,000 lbs.

Resident engineers in charge of construction engineering on the aforementioned projects are G. W. Thompson for the bridge work and W. C. Hite for the road work.

The bridge work is under the general supervision of Assistant State Highway Engineer F. W. Panhorst and the road work and right of way acquisition and clearance under the general supervision of Assistant State Highway Engineer B. W. Booker.

Looking northerly from Army Street showing progress of freeway construction from Army Street to 17th Street. Twenty-fifth Street pedestrian overcrossing and 23d Street vehicular overcrossing visible in foreground. Steel viaduct construction now in progress is visible in background.



Eastshore Freeway

Construction on Unit, San Jose and Warm Springs, Under Way

By L. A. MARKS, Resident Engineer

CONSTRUCTION is now well under way on the 9.85 mile section of the Eastshore Freeway (Routes 5 and 69) in Santa Clara and Alameda Counties, between San Jose and Warm Springs. The completion of this unit will be another step forward in forming the long needed modern traffic artery between the San Jose-Santa Clara Valley area and the East Bay metropolitan area centered around Oakland. Not only will it provide a much safer uninterrupted flow of traffic than the present congested facilities for heavy commercial and passenger traffic between Oakland and San Jose, but it will be an aid to national defense in serving the many military installations in this area.

Existing Highway Inadequate

The project is on new location which utilizes no portion of any existing highway and when completed will replace the long outmoded section of Route 5 between San Jose and Warm Springs. The existing highway from San Jose to Warm Springs is seriously deficient from the standpoint of capacity and safety features. The average daily traffic on Route 5 between these termini in 1951 was 11,800 vehicles south of Milpitas, which is considered the average for this section, rendering the two and three lanes, which the present Route 5 provides, inadequate to a very undesirable degree. This volume is expected to increase to 23,000 by 1970.

In addition to the lack of proper width the existing Route 5 also has three railroad crossings at grade. One of the crossings located just northerly of Milpitas is a particularly dangerous one, as it is located between two reversing highway curves having radii of approximately 500 feet and affording very limited vision.

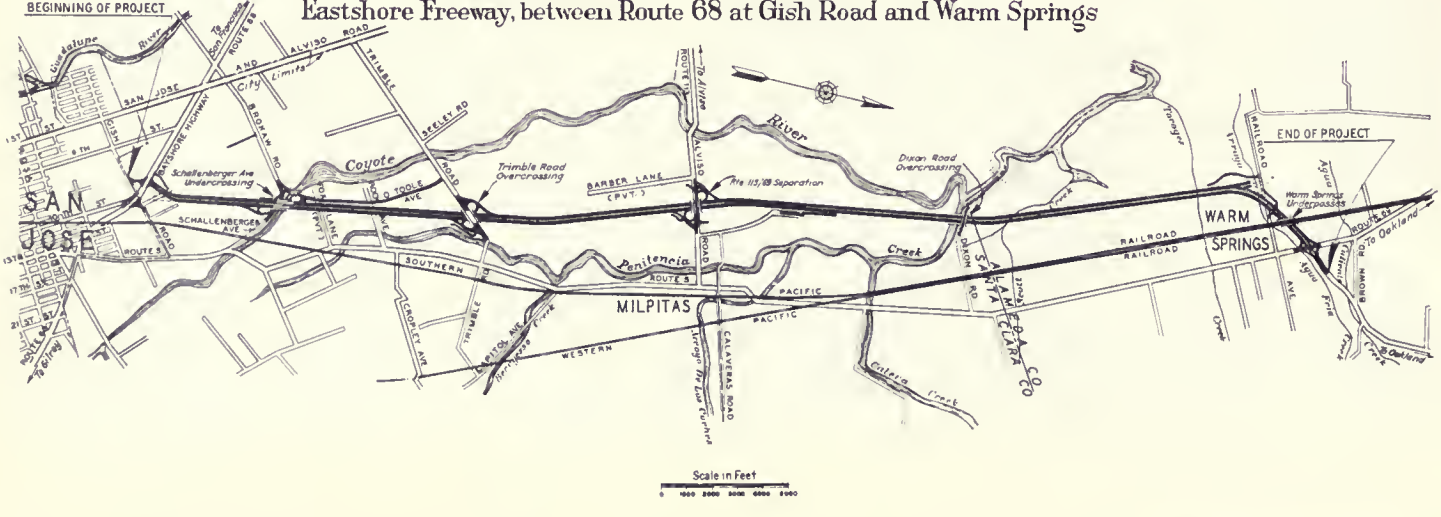
Unit Under Two Contracts

The construction of this section is under two separate contracts. A section 1.8 mile in length, between 0.9 mile north of Route 68 and 0.2 mile north of Trimble Road, was awarded to Fredrickson and Watson Company and M & K Corporation at a contract price of $1,261,000. Work on this section was begun on January 31, 1952, and is scheduled for completion in the summer of 1953. This section of road has its beginning or southerly terminus just south of Brokaw-Schallenberger Roads which are two-lane asphalt surfaced county roads. The northerly terminus of the project is just north of Trimble Road, also a county road. Access to the freeway will be provided by two two-quadrant interchanges, one at Brokaw-Schallenberger Road and the other at Trimble Road, both of which are connected by the same frontage road. This section of the project will serve limited local traffic and provide an important haul bridge for construction of the second section.

Second Section

The second section of the project between Route 68 at Gish Road to 0.9 mile north of Route 68 and from north of Trimble Road to Warm Springs, 8.1 miles in length, is under contract to Granite Construction Company of Watsonville. Work on this section was begun on August 23, 1952, at a contract price of $2,500,000 and is scheduled for completion in the spring of 1954. This section will have its southerly terminus at the junction of Route 68, Bayshore Highway, with a temporary channelized intersection at this junction and which

In Santa Clara and Alameda Counties,
Eastshore Freeway, between Route 68 at Gish Road and Warm Springs





This photograph shows construction at Trimble Road overcrossing

will later be replaced by an interchange under a future contract. The northerly terminus of this section will have a temporary channelized connection at the present junction of existing Route 69 and Route 5 and which will also be replaced by an interchange under a future contract.

Work to Be Done

The road work on both projects consists of grading a four-lane divided highway together with road connections, road approaches and frontage roads. Freeway pavement will be portland cement concrete with plant mixed surfacing on the shoulders and on the various connecting roads and ramps.

There are four major structures in another contract, all of which are of reinforced concrete construction.

To allow Trimble Road to cross the freeway, an overcrossing 256 feet long consisting of four reinforced concrete slab spans and two reinforced box girder spans, supported on reinforced concrete abutments and bents with concrete pile foundations, is being constructed.

A bridge about 282 feet in length consisting of seven reinforced concrete slab spans, supported on concrete pile bents, providing a clear roadway width of 26 feet is being constructed at the Coyote Creek frontage road.

Coyote Creek Bridge

The main line bridge at Coyote Creek is composed of two parallel structures. One structure is about 501 feet in length consisting of nine reinforced concrete girder spans and the other structure is 464 feet in length consisting of eight reinforced concrete girder spans. Each structure will provide a clear roadway width of 28 feet.

Major structures in a separate contract consist of an underpass, two overcrossings, and a bridge across Penetencia Creek.

An underpass consisting of two structural steel plate girder bridges with steel plate decks about 114 feet



Looking north on freeway at Shallenberger-Brokaw Road, showing Coyote Creek Bridge, Coyote Creek frontage road bridge and freeway under construction.

in length, composed of two spans supported on reinforced concrete abutments and a center pier with concrete pile foundations, will carry the tracks of the Southern Pacific and Western Pacific Railroads over the freeway.

A reinforced concrete slab bridge about 134 feet long, composed of two spans supported on reinforced concrete abutments and a center bent with concrete pile foundations will carry State Route 113 over the freeway, while a similar bridge 109 feet long will carry Dixon Road over the freeway.

To allow the freeway to cross Penetencia Creek, a reinforced concrete slab bridge about 95 feet long consisting of two parallel structures composed of five spans supported by concrete pile bents, is to be constructed.

Grades and Alignment

The freeway alignment in the first contract consists of a single long tangent and traverses an almost level plane necessitating the use of very flat gradients. Grades for the freeway proper in this section vary between 0.06 percent minimum and 0.31 percent maximum except at the crossing of the Coyote Creek near the beginning of the project where 3 percent grades are used.

There is no excavation between the limits of this section with the entire freeway being built on low embankments throughout its entire length, the only exception being the approaches to the structure crossing Coyote Creek. Maximum embankment height at these approaches will be approximately 18 feet, whereas finish grade averages approximately four feet above original ground throughout the remainder of this section.

The alignment provided in the second contract differs somewhat from the alignment of the first contract in that there are three large radius curves within its limits. This section is also

constructed on low embankments and it employs the use of flat gradients comparable to those used in the first section.

Major Construction Items

Major construction items in the first contract include 360,000 tons of imported borrow; 80,500 cubic yards of channel excavation; 5,619 cubic yards of Class "A" Portland cement concrete; 10,500 cubic yards of Portland cement concrete pavement and 21,770 feet furnishing concrete piling.

The imported borrow for embankment was obtained from a borrow pit about four miles from the project and was hauled at a rate of about 3,500 tons per day.

The major construction items in the second contract include 937,000 tons of imported borrow; 137,000 tons of imported subbase material; 122,000 tons imported base material, 24,500 tons plant mixed surfacing; 42,000 cubic yards of Portland cement concrete pavement; 17,400 feet concrete piling; 4,100 cubic yards of Class "A" structure concrete; and 12,000 feet of reinforced concrete pipe of various sizes.

The imported borrow for this contract is being obtained from a borrow pit about two miles from the project and is being hauled in two shifts at a rate of about 5,000 tons per day.

Before construction could begin on the second contract, the relocation of several major public utility facilities was necessary. It was necessary to relocate The Pacific Telephone and Telegraph Company's coaxial cable carrying transcontinental radio programs, before work could be started on the railroad underpass and shoofly trestle at Warm Springs. It was also necessary to relocate a Pacific Gas and Electric Company 20-inch gas main and encase a 34-inch gas main before work on the roadway could be started. These public utility facilities were relocated at State expense by The Pacific Telephone and Telegraph Company and Pacific Gas and Electric Company, respectively.

This contract is financed with state and federal funds while the first contract is financed wholly from state funds.

Construction is under the supervision of Assistant State Highway Engineer B. W. Booker and Assistant District Engineer R. P. Duffy, with the author as Resident Engineer, and R. C. Colley, Bridge Department Representative.

General Superintendent for Fredrickson and Watson and M & K Corporation on the first contract is Bernard Fredrickson. General Superintendent for Granite Construction Company on contract No. 2 is J. L. Farrell.



Winterbouer pit located 2.5 miles east of the job. It was the source of 360,000 tons of imported borrow.

Heavy Traffic Toll in South

An automobile killed someone in the southland every four and one-half hours during 1952, it was reported today by the Public Safety Department of the Automobile Club of Southern California.

In the 13 counties of Southern California, 1,990 persons were killed as the result of motor vehicle accidents last year. This is 7 percent above the 1951 fatality toll and 22 percent more than in 1950. Last year's southland casualty count was the fourth worst in history. The highway death toll in five of the counties was the highest on record. The five counties are Imperial, Kern, San Bernardino, San Diego and Santa Barbara.

Gaviota Tunnel

Limited Access Freeway Section on U. S. 99 Is Nearing Completion

By JOHN E. WITTE, Resident Engineer

CONSTRUCTION of the Gaviota Pass Tunnel in Santa Barbara County is approaching completion. The remaining work, consisting of placing the Portland cement concrete tunnel lining, portal structures, and paving will be completed early this year.

This project is one of a series of contracts which, when completed, will provide a limited access freeway between Gaviota and one mile north of Nojoqui Summit, a distance of approximately 8.3 miles. The work on this section was begun in May, 1950, and is scheduled for completion in the fall of 1953 at an estimated cost of $3,300,000.

The major part of the realignment lies on the east side of Gaviota Canyon, traversing the Santa Ynez Range from north to south. Geological reports indicate this mountain range was the result of an uplift along the Santa Ynez fault and the new road alignment crosses near the northern end of this formation with the range rising abruptly south of the fault to an elevation of 2,500 feet and then sloping seaward. The down cutting of the sedimentary formation by Gaviota Creek, along with differential erosion, have combined to form Gaviota Canyon with its steepest walls at Gaviota Gorge.

It was here on Christmas Day in 1846 that natives and soldiers from the Presidio of Santa Barbara lay in ambush for Lt. Col. John C. Fremont and his battalion marching south for the purpose of engaging the California forces in the deciding battle of the Mexican War. Advised of the plot to ambush his forces in the narrow gorge, Fremont, guided by an American rancher, Benjamin Foxen, flanked the Californians by crossing the Santa Ynez Mountains at San Marcos Pass instead of at Gaviota Pass and went on to capture Santa Barbara and assist in the fall of Los Angeles to the American Army.



South portal showing completed heading section. Blower for removing powder fumes is shown at left of the portol. Bulkheod obove the portol is to prevent folling rock from hitting workmen ond equipment.

Tunnel Method Chosen

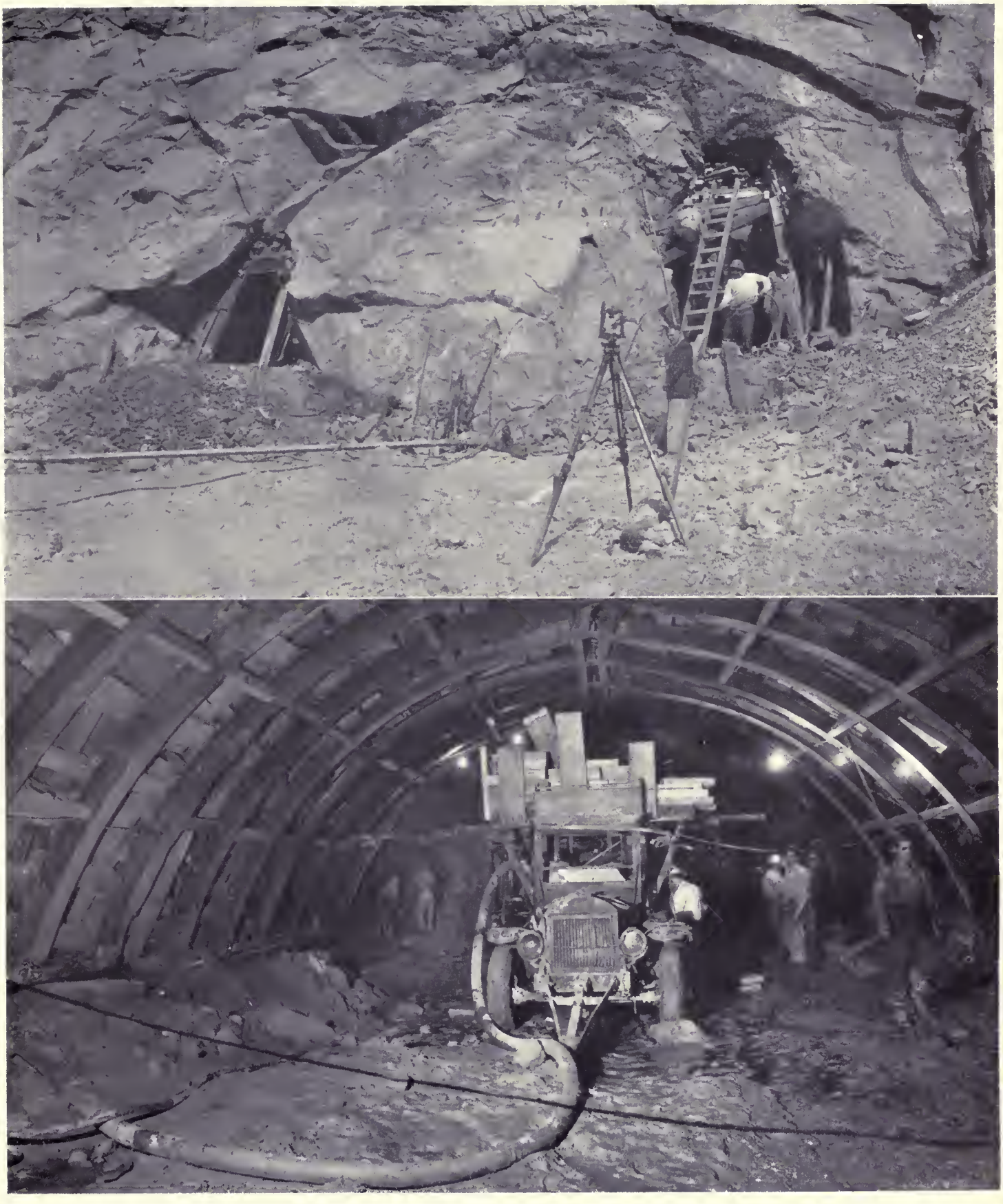
In order to provide for a four-lane limited access freeway through the narrow gorge it became necessary to choose between two methods of providing the required roadway areas. The first alternate was to construct an open cut through the east side of the gorge. This posed two problems, the first being that it would involve the removal of approximately 400,000 cubic yards of rock for which there was not sufficient waste area within the limits of economical haul.

The second problem presented by the construction of the open cut was that it would destroy not only the rugged beauty of the gorge, but also a landmark prominent in California's history.

The second alternative was to drive a tunnel through the eastern flank of the gorge. Since this method would preserve the beauty of the gorge and the historical landmark and also provide the most economical route, it was decided that the driving of the tunnel would be the better means of providing an expressway through the gorge.

Contract Awarded in 1951

A contract was entered into with the Rhoades-Shofner Construction Company of Los Angeles on July 2, 1951, for construction of a Portland cement concrete lined tunnel 435 feet long, including grading and paving of 0.1 mile of roadway. Clearing and grubbing of the roadway area was started July 18th while



UPPER—South partal shawing the timbered left and right wall plate drifts. Unstable rock above the right drift necessitated the constructian af twa aversize square sets. LOWER—Scene at the face of the heading shawing the drill jumbo in the center. Ta the left af center can be seen the wall plate upan which the steel segment is secured. Miner at left is setting up ta drill the left wall plate drift.

initial drilling operations began on August 7, 1951.

The first stage of construction required the establishment of a working face at the south portal site from which to begin the tunneling operations. In order to establish this face it was first necessary to construct a through cut which required the removal of 8,000 cubic yards of weathered sandstone.

Because of its close proximity to the traveled way, the construction of the through cut required a method which would minimize the delay to heavy summertime traffic due to blasting operations. The method used involved the construction of a series of five benches of a size to control the amount of material removed during blasting and excavating procedures. The construction of a typical bench was accomplished by drilling 198 holes, averaging 16 feet in depth with Ingersoll-Rand J-50 jackhammers, loading the holes with three quarters of a pound of Atlas 40 percent dynamite per cubic yard of rock to be removed, and detonating the charge with Atlas Rockmaster electric detonators by use of a 115-volt blasting circuit. The broken material was bulldozed down to the roadway level where it was loaded into 10 cubic yard Euclid dump trucks by means of a Lorain 77, 1½ cubic yard diesel shovel and hauled to one of the two embankment areas south of the tunnel site. In order to prevent conflict with highway traffic the contractor's trucks used a haul road approximately 20 feet in width, which was constructed between the two fill areas east of the present traveled way.

Problem of Fault

With the removal of the material from the south portal cut studies were made to determine the stability of the formations which might be encountered at the face of the portal. A fault zone encountered directly above the portal indicated that the sandstone layers had been subjected to considerable movement, leaving little cohesion between the blocky, unstable layers.

During the excavation of the south portal cut, cracks began showing in the face of the newly-exposed rock to the right above the planned portal. When the clay seams between the steeply bedded sandstone layers allowed slippage to take place, the cross-bedding became evident throughout the right side of the portal face. This movement was aggravated by air slacking of the exposed rock surface. Since this unstable rock face constituted a hazard to workmen, equipment and future traffic, an additional 3,000 cubic yards of material was removed from above the south portal.

Geological data indicated that the tunnel was to be driven through the middle member of the Gaviota formation, consisting of fine- to medium-grained concretionary sandstone, bedded in layers varying in thickness from a few inches to several feet. The Gaviota Gorge is the center of numerous faults, the largest being the Santa Ynez which causes the rock structure through which the tunnel was to be driven to be shattered, blocky, seamed, and fissured.

Heading and Bench Method

With this information in mind and from studies of the formations encountered during the excavation of the portal cut, it was decided that the tunnel could be driven with less difficulty and with greater safety by use of the heading and bench method of tunnel excavation. The choice of this method was based upon the knowledge that the rock to be encountered during the driving of the tunnel would be of an unstable nature, and would in all probability require the use of tunnel supports for at least the first 120 feet. The heading and bench method provides for the removal of the heading from the crown to the spring line as the first excavation cycle and the removal of the bench from the spring line to the floor as the second excavation cycle. The method offers the advantage of providing the bench as a convenient work platform for the placing of the arch supports while allowing the mucking to proceed simultaneously. Due to the fact that steel products were not readily available, mine grade timber was used for tunnel supports.

Tunnel Bore Semi-circular

The tunnel bore is semicircular above the spring line with the sides continuing in an arc until they intersect the sidewalks which are nine inches above the concrete pavement. The pavement is on a 10 percent superelevation. The use of the heading and bench method required that the upper 15 feet of the bore, which is the heading, first be removed for the entire length of the tunnel after which the lower 10 feet, the bench, was removed, thus completing the planned section. The south portal heading was established by driving two wall plate drifts 24 feet in depth, for the purpose of placing 12-inch x 12-inch timber wall plates to serve as a base for the timber tunnel supports.

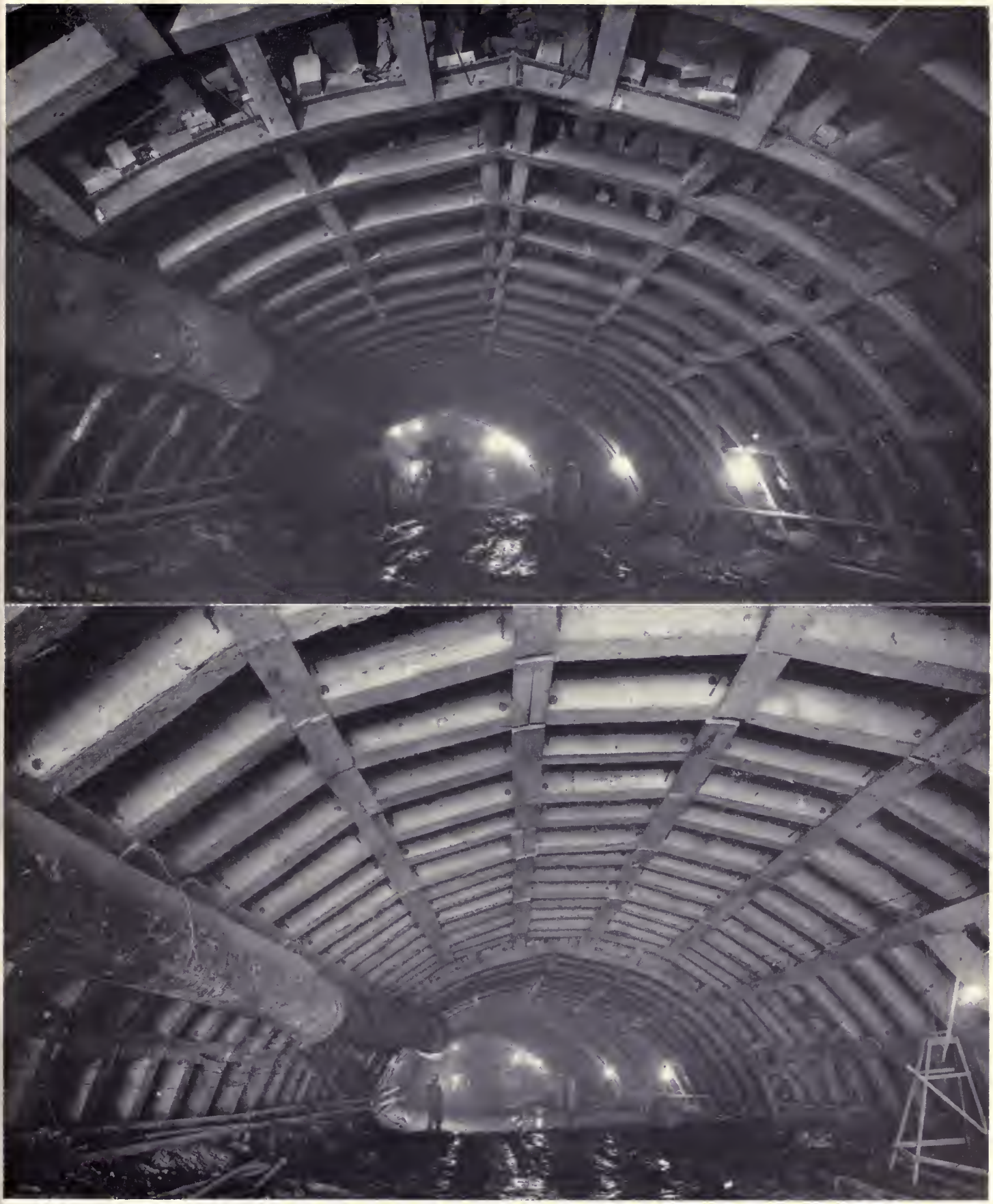
Actual construction of the tunnel bore was begun on November 3, 1951, in the left wall plate drift. The drifts were five feet wide at the top, seven feet wide at the base and seven feet high, with the outer edges 20 feet from the tunnel centerline.

To support the unstable sandstone during the driving of the wall plate drifts, temporary timber sets were installed consisting of 8-inch x 8-inch posts and 3-inch x 12-inch lagging. Alternation of drilling and shooting with "muck" removal facilitated simultaneous work on the two drifts. With the removal of the natural support in the right drift, cracks developed over the portal requiring installation of two oversize square timber sets at the entrance to the portal.

Wall Plate Drifts

After the wall plate drifts were advanced to a depth of approximately 24 feet, provision was made to install the permanent 12-inch x 12-inch timber wall plates; however, some difficulty was encountered due to the tunnel being on a 1,200-foot radius curve.

The two wall plate drifts were connected by driving a stope along the periphery of the tunnel arch in order that two nine-segment timber arch sets could be installed. The removal of the remaining arch material back to the south portal was carried on from the south face of the stope, which was removed in four-foot rounds. This procedure was followed until only



UPPER—Transition from timber to steel tunnel supports. The trill jumba is shown in the background. LOWER—Photo showing the nine-segment timber tunnel suppart in the heading section. Steel supports are shown in the background. Note that the steel supports require less excavotion and therefore less concrete lining thickness than the timber supports. Thirty-inch blower line is shown ot left center.



Jumbo in operation showing general position of drills at face

four feet of rock wall remained between the north face of the stope and the outside face of the portal. In order to prevent the unstable face rock from being displaced, holes of a size approximately two feet square were shot through the remaining wall and 8-inch x 8-inch timber crown bars at three-foot centers were extended through from the sets previously placed to a point beyond the portal face. After the crown bars were placed and blocked the number one timber arch was placed at the south portal. With the removal of the core material below the timber arch sets to the level of the wall plates, the south portal was established and the driving of the heading was begun.

Drilling Operations

Advancement of the heading was accomplished by driving the wall plate drifts on either side ahead of the core and placing the nine-segment timber arch as the excavation progressed. These drifts were of the same size as that of the portal, but did not require the use of timber sets as the unweathered sandstone possessed more stability. The material in the drifts was drilled, shot, and then removed from the heading by means of a Pacific slusher operated from an Ingersoll-Rand air tugger.

The main heading, with a cross-section area of approximately 400 square feet, was advanced in five-foot rounds by drilling with five Ingersoll-Rand pneumatically operated drills mounted on a jumbo. Three drills were operated from a cross bar on the bottom deck while two drills, mounted on Chicago pneumatic jibs, worked off the top deck. The number of holes in the heading round varied from 60 to 120, depending on the condition of the rock. Depending upon the amount of overbreak and the fragmentation of the material affecting the efficiency of the mucking operation, the average progress varied from 5 to 10 feet per round.

Fumes Removed

Blasting fumes and fouled air were removed from the tunnel heading with a 25,000 C.F.M. Seracco No. 6 turbine

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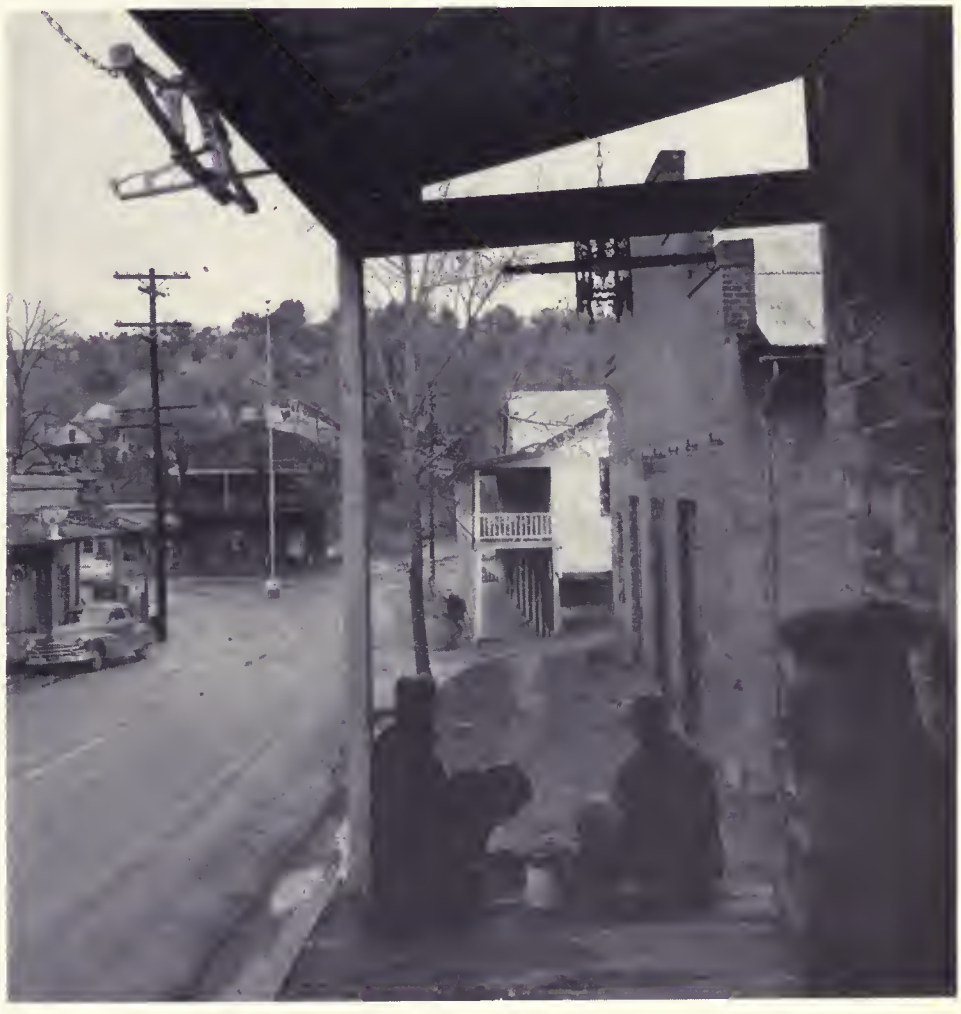
New Bridges

Modern Structures Built on Route Traveled By 49ers

By ROBERT M. BARTON, Associate Bridge Engineer

One of California's most interesting and picturesque tourist attractions is Sign Route 49—the "Mother Lode" or "Golden Link" Highway. Beginning at the junction with State Sign Route 89 in Sierra Valley north of Lake Tahoe, it crosses Yuba Pass at an elevation of 6,701 feet, then descends the Yuba River and swings south, traversing the scenic oak-covered foothills of the Sierra Nevada.

In its 272-mile length it connects almost all of the important historical Gold Rush communities—from Downieville, Nevada City, Grass Valley, and Auburn of the "Northern Mines"; through Coloma, the gold discovery site, and Placerville (Old Hangtown); to Sutter Creek, Jackson, San Andreas, Angels Camp, Columbia (now a state historical monument), Sonora, and Coulterville of the "Southern Mines." It terminates at Mariposa on Sign Route 140—the "All Year Highway" to Yosemite National Park. The road is one along which the leisurely traveler can find many ivy-covered ruins and landmarks to recall the days when the quest for gold caused large mining camps to spring up and then disappear almost overnight. This is the country which Mark Twain and Bret Harte used as the locale of many of their fascinating tales.



View of main street of historic Amador City

Celebrated Mines

Between Camptonville and Downieville the highway passes along the edge of the enormous canyon-like Depot Hill hydraulic mine. Near Sutter Creek, Amador City, Tuolumne Hill, and Jackson the tipples, drifts, and dumps of deep hard rock (lode) and placer mines can be seen in all directions. Here are such celebrated mines as the Keystone, Central Eureka, Argonaut, Kennedy, and Morgan. About one mile north of Jackson still stand four enormous wooden wheels, each about 50 feet high, which were used several decades ago to hoist slickens (pulverized material from crushing mills) into a tailings pond. Near Columbia the white bedrock exposed by early mining operations forms an unusual topographic feature.

One of enormous wooden wheels used by miners decades ago to hoist slickens



During the past century, however, the economy of the Mother Lode region has gradually shifted from mining to agriculture, logging, water resources and hydroelectric developments, and recreation. The highway passes immediately alongside the Moccasin Creek power plant, one part of San Francisco's giant Hetch Hetchey water supply system. And at Melones the highway crosses the upper arm of the reservoir formed behind

Melones Dam on the Stanislaus River. Today the trash burners of lumber mills probably exceed in number the mine tipples found along this highway.

So whether the motorist is looking for hydro plants, crumbling masonry walls, evidences of early day mining operations, modern logging activities, or jumping frog contests, he will find much along Route 49 to interest him. The highway well deserves its reputation as an enjoyable and rewarding recreational road.

Construction Problems

To the highway engineer, however, the route poses many difficult and costly construction problems, since it crosses all of the important rivers draining the Sierra Nevada Mountains through the gold country—the Yuba, Bear, American, Cosumes, Mokelumne, Calaveras, Stanislaus, Tuolumne, and Merced Rivers. Indeed, the highway may be described as consisting of an alternating series of stream crossings and ridge crossings. Across one river—up the opposite ridge, and down the other side—across another river—up a second ridge, and down again—another river—and so on in almost monotonous repetition. At times the motorist may believe the distance he is traveling up and down exceeds that in the horizontal direction. Many of the rivers are in deep canyons, and the problem of road building is made more difficult because heavy mountain-type construction is often necessary as the highway descends the precipitous slopes leading down into these canyons.

Flood Dangers

To construct bridges across the swift and occasionally raging waters of these Mother Lode streams has required the constant efforts of bridge builders for more than a century. Since 1850, when Little built a wooden toll structure across the South Fork of the American at Coloma (where James W. Marshall made his epoch discovery of the yellow metal only two years earlier), there probably has been scarcely a day when someone in the Mother Lode country has not been busy either building or repairing a bridge across one of these streams.



The Mother Lode, or Golden Link, highway shown on this map as Sign Route 49

For the racing torrents of recurring floods have carried away countless structures, and decay, vehicular accidents, and the need for widening and realignment have also taken their toll.

However, during the past five years there has been an unusual spurt of bridge building activity on the Mother Lode Highway. The growth of logging in the area, new hydroelectric developments, and the increased growth of tourist traffic all made it necessary at the end of World War II for the Division of Highways to undertake the progressive replacement of practically all of the major bridges on Sign Route 49. Today this program is well under way, with a number of new bridges completed and others under construction. More new bridges are planned for the near future. The new structures are all wider, stronger, and on better alignment than their predecessors, and will afford permanent protection against bridge washouts at the crossings of the turbulent Mother Lode streams.

New Stanislaus River Bridge

At the present time the most important new structure being built on this highway is across the Stanislaus River at Melones, on the boundary between Calaveras and Tuolumne Counties, between Angels Camp and Sonora. It replaces a handsome but very narrow concrete arch, built over 40 years ago, which was undermined and fell into the river in January, 1951.

The severe floods last winter, it is believed, eroded the honeycombed concrete in the center pier, and caused the tired old structure to collapse.

The new bridge is a concrete box (hollow cellular) girder structure about 400 feet long, and is located only a few yards from the site of the destroyed arch. It cost about $280,000. In the meantime state highway traffic is detouring on county roads via Columbia and the Parrott Ferry Bridge while the new Melones Bridge is being built. It is hoped the new bridge will be completed by July of this year.

New Mokelumne River Bridge

Just a few months ago a new reinforced concrete box girder bridge across the Mokelumne River was completed. Located about five miles south of Jackson, the new bridge is 365 feet long and cost about $140,000. It is situated just a few miles downstream from the famous Electra hydroelectric development of the Pacific Gas and Electric Company. The Mokelumne River, after having passed through several P. G. & E. powerhouses in its descent from the Sierra, flows beneath Route 49 to be impounded behind the great Pardee Dam of the East Bay Municipal Utility District, where it is stored for use of the Cities of Oakland, Alameda, Berkeley, Richmond, and other East Bay communities.

Incidentally, the old bridge across the Mokelumne River was probably one of the most unique collections of junk on the Pacific Coast. Originally built as a one-way toll bridge, reportedly about 1911, it later was purchased by the county. The main span across the river consisted of a very weak and often battered steel "pony" truss, which in recent years had been propped up with secondhand railroad bridge girders butt-welded together. The approach trestle was supported partly by wooden bents, partly by steel bents, and partly by some old steel or cast iron penstocks which originally had seen service in a now forgotten hydro development. (The foundations of one of California's first hydroelectric plants, that of the Blue Lakes Water Company, built in 1897 as a predecessor of the Electra plant, can still be seen a short distance upstream, and it is possible the penstock



UPPER—Typical of the many narrow bridges which were once found along the Mother Lode Highway was this steel pony truss across Murray Creek in Calaveras County. Demolished in a 1949 truck accident, it has since been replaced with a bridge of adequate width. CENTER—New concrete box girder bridge across the Cosumnes River near Plymouth, completed 1952. The old timber truss built in 1930 can be seen on the left, the timber trestle approaches having been removed at the time this photo was taken. LOWER—New bridge across the North Fork of the Calaveras River near San Andreas. Completed in 1952, it replaces an old, tumble-down timber trestle.

columns may have come from that project).

The wooden stringers and deck of the old bridge had reached such an advanced state of deterioration and decay that it was feared the wheels of a heavily loaded truck might punch through the deck at any moment. During the floods two years ago some of the timber bents of the approach trestle were swept away, making it necessary to close the bridge to traffic for several days. In short, the old structure was in precarious physical condition. Also, it was one of the last one-way bottlenecks on a highway that is rapidly being developed to modern two-lane standards.

Other Recent Bridges

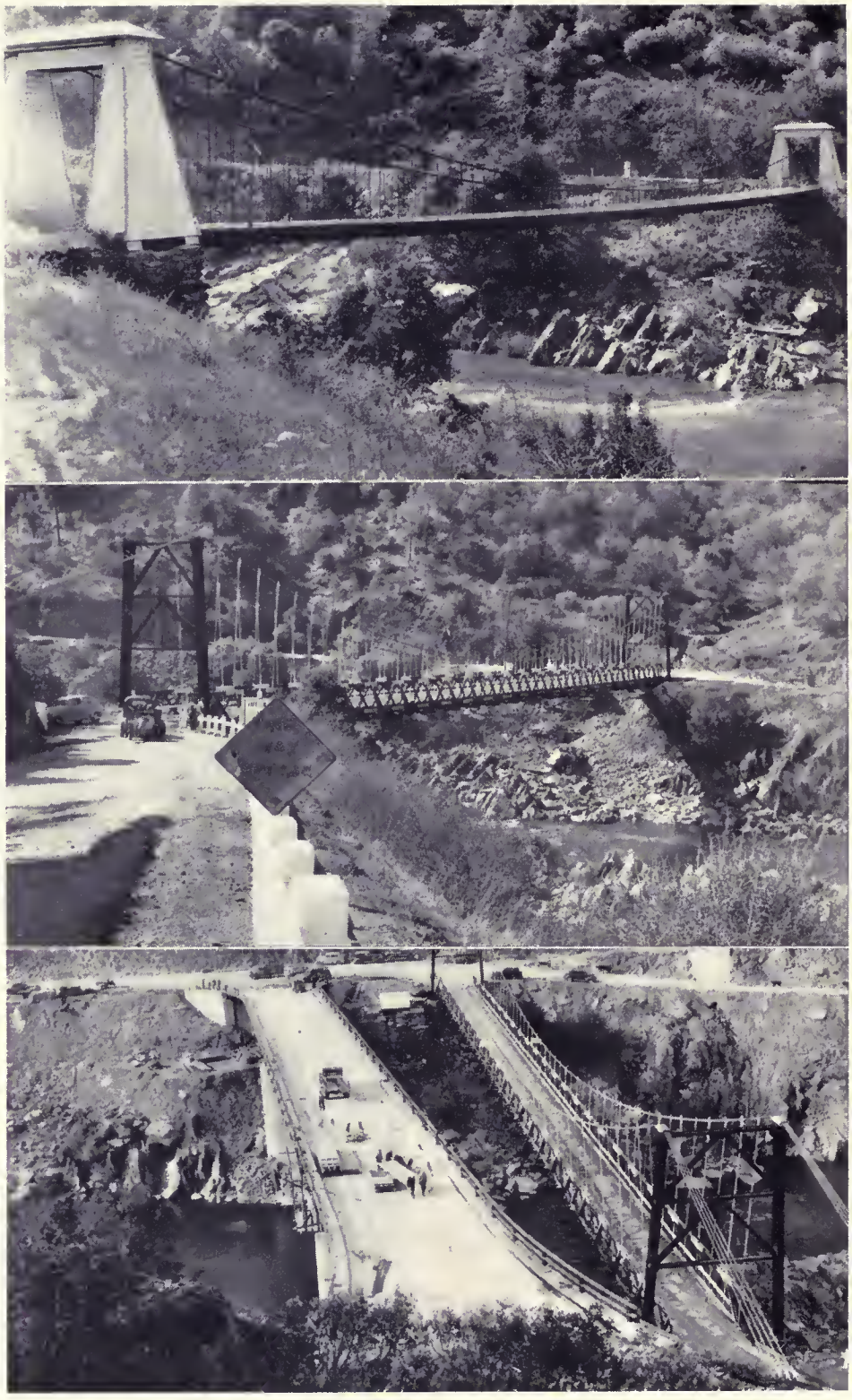
The first important bridge conconstructed on Route 49 following the end of the war was a $270,000 steel girder structure across the North Fork of the American River near Auburn. This bridge, completed in 1948, replaced a temporary, one-way suspension bridge that, at the time, was feared to be in imminent danger of collapse. As a precautionary measure, school children were required to get out of their school bus and walk across the bridge until the new structure was opened to traffic.

The following year saw the completion of a new steel truss bridge costing $190,000 across the Tuolumne River at Stephens Bar, between Sonora and Moccasin Creek. The bridge also carries Sign Route 120, the Big Oak Flat road to Yosemite National Park. The new bridge replaced a rusty old one-way steel truss, which was so weak that passenger cars only were allowed on it, with trucks being required to ford the river.

The new steel girder bridge across the South Fork of the American River at Coloma, the gold discovery site, was completed in 1951. This bridge, costing $200,000, shortened the route distance between Auburn and Placerville by almost one-half mile, and replaced a narrow wooden truss that was in an advanced state of decay.

Consumnes River Bridge

This past year three important new structures have been completed. The new box girder bridge across the Mokelumne River between Jackson and Mokelumne Hill has been mentioned.



Narth Fork American River near Auburn. Three bridges have stoad at this site during the past ninety years. The first structure (top) was erected in 1865 using cables that had ariginally been emplayed at another lacation. Dismantled in 1929, it was replaced by the suspensian bridge shown in the center illustratian. (Lower) The present bridge, built in 1948, is shawn during canstructian, with the secand bridge on the right, and the abutments of the 1865 structure between.

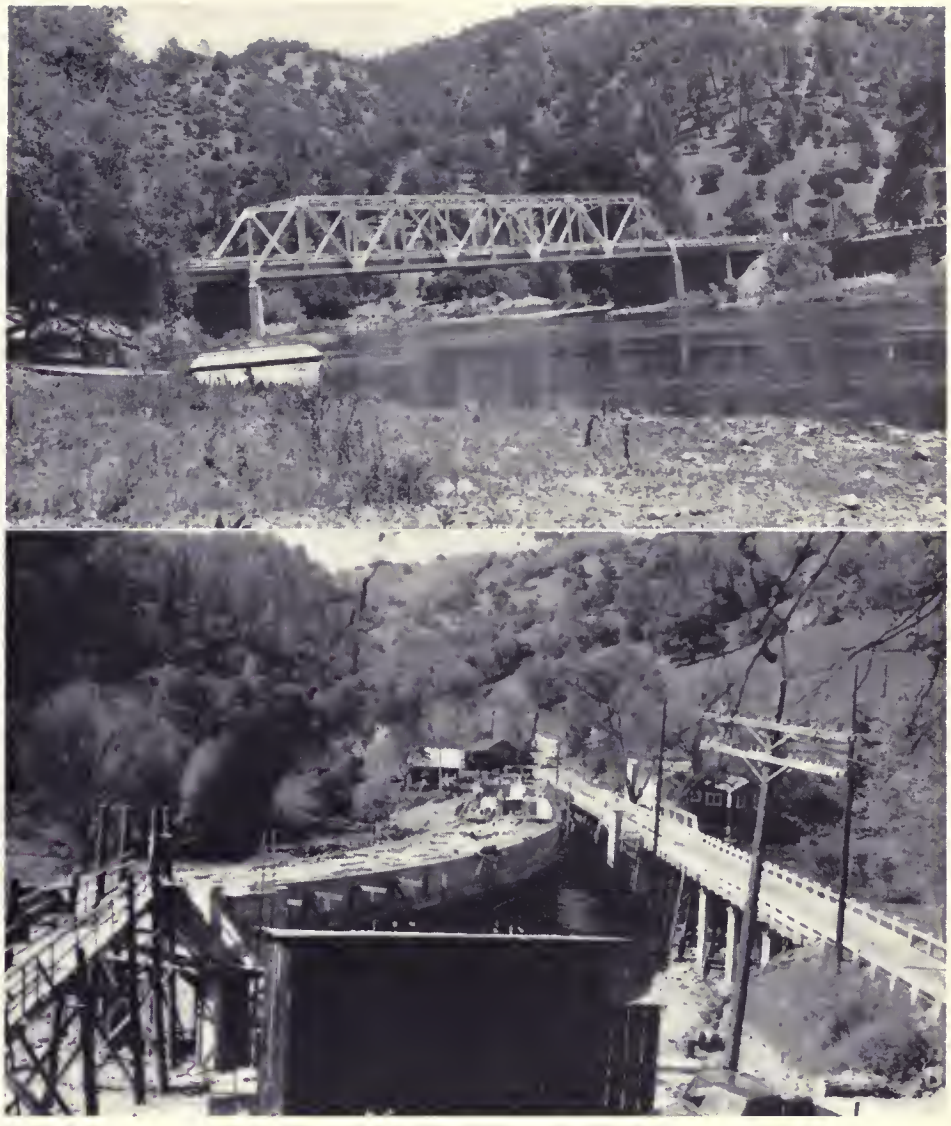
The second new structure is at Plymouth, between Jackson and Placer-

ville, where an old wooden truss across the Cosumnes River has been supplanted with a $200,000 concrete box girder. The third is a new concrete slab bridge across the North Fork of the Calaveras River, between Angels Camp and San Andreas. It replaces an old tumbledown timber trestle.

Also worthy of mention are two structures completed in 1948 at Auburn, one an underpass carrying the highway beneath the tracks of the Southern Pacific Railroad, and the other a separation structure, carrying Route 49 beneath four-lane U. S. 40.

A number of other smaller structures have also recently been erected on the Mother Lode Highway. North of Nevada City a handsome new culvert across Willow Creek has been built by the U. S. Bureau of Public Roads as a forest highway project to replace a narrow old concrete bridge. Near Downieville a culvert across Indian Creek replaces another narrow old concrete structure. Several small, narrow structures near Sonora have been widened or replaced with culverts.

Another new bridge just completed is located at Moccasin Creek in Tuolumne County and replaces a rickety old steel truss which is so narrow that two cars could not pass at one time. The new bridge is of reinforced concrete and is noteworthy because of its unusual inclined or buttress-type bents.



UPPER—New steel truss bridge across the Tuolumne River at Stephens Bar, between Sonora and Mariposa. Completed in 1949. Trucks formerly were required to ford the river at this point. LOWER—Construction of new Mokelumne River bridge near Jackson. Old bridge on right.

More New Bridges Planned

As a continuation of the improvement program on Route 49, it is planned to build a new structure within the next few years across the North Yuba River in Sierra County. The present bridge is on extremely poor alignment, with a sharp right angle turn at one end; it is of substandard strength; and it is dangerously narrow, having a width of less than 16 feet. Trucks attempting to drive onto the span now must maneuver very slowly and carefully to avoid hitting the end of the bridge.

Road Now Greatly Improved

As a result of the numerous improvements completed by the Division of Highways since it assumed jurisdiction over the Mother Lode Highway in 1921, motorists do not have to be intrepid adventurers as was once the case. Tortuous roads dating from the 1860's have been replaced by modern sweeping highways; steep grades have been reduced; flimsy and narrow bridges have been replaced by wide, modern ones; and travel through the narrow streets of the Mother Lode communities has been greatly expedited. Highway and bridge improvements totaling almost 7 million dollars in value have been undertaken on various portions of the route since the end of World War II, and more will be spent within the next several years. Part of the route (between Grass Valley and Nevada City) is even to be developed within a few years into a four-lane divided freeway—a far cry indeed from the first wagon trails built in the Mother Lode region just over a century ago.

Of the improvement work accomplished to date, most has been financed from the State Highway Fund, supplemented by Federal Aid Secondary and county sources. However, between Nevada City and Downieville about $1,700,000 of the work has been financed by the Federal Government, since this portion of Route 49 is classified as a forest highway. Design and supervision of construction of



South Fork of American River at Coloma (bottom). Completed in 1951 at a cost of $189,000. This new bridge is near Coloma, the gold discovery site. It replaces a timber truss built in 1928, which in turn replaced an earlier wooden bridge which had been completely destroyed by fire. The new structure is on improved alignment and saves approximately one-half mile over the former crooked line. (Top) The old wooden truss.

projects south of Nevada City have been handled by the Division of Highways, while most projects between Nevada City and Downieville have been under the jurisdiction of the U. S. Bureau of Public Roads.

Do You Follow These Driving Rules on Road?

What makes a good driver? Lightning-fast reflexes? Exceptional eyesight? Cool thinking in the face of danger? Yes, these are attributes which may help to make a good driver even better but there are others which are essential.

The judgment to drive no faster than traffic conditions warrant.

The practice of giving clear, correct hand-signals.

The habit of not taking chances when driving—however small.

The courtesy of yielding the right of way in any questionable situation.

It is often true that a person of 50 or 60 is a far better driver than a youth in his early twenties because the adult possesses these essential qualities of good driving which are lacking in the younger person.

McCurry Is Elected New CSAA President

HAROLD J. MCCURRY, Secretary-Manager of the Retail Merchants Association of Sacramento, is the new President of the California State Automobile Association. He was elected by the association board of directors at its annual meeting on January 15th in San Francisco.



HAROLD J. McCURRY

McCurry was for many years an official of the California State Fair, supervising press and radio activities. He gave up this civic work about a year ago when he retired as a vice president of the Bank of America, continuing as a member of the bank's advisory board in the State Capital.

Other officers elected for 1953 were Edward H. Peterson, San Francisco, and Charles G. Bird, Stockton, vice presidents; Fred J. Oehler, San Jose, treasurer; D. E. Watkins, secretary and general manager; Edwin S. Moore, assistant secretary and general manager. Eight directors were elected at the association membership meeting to new three-year terms on the CSAA board. They are: Clyde W. Rann, Redding; Irving H. Kahn, Oakland; Porter Sesnon, San Mateo; J. J. Krohn, Arcata; H. R. Basford, San Francisco; John R. Graham, Merced; Norman S. West, Modesto; and J. B. Rice, San Rafael.

Rio Hondo Bridge

Santa Ana Freeway Structure Calls for Unusual Construction

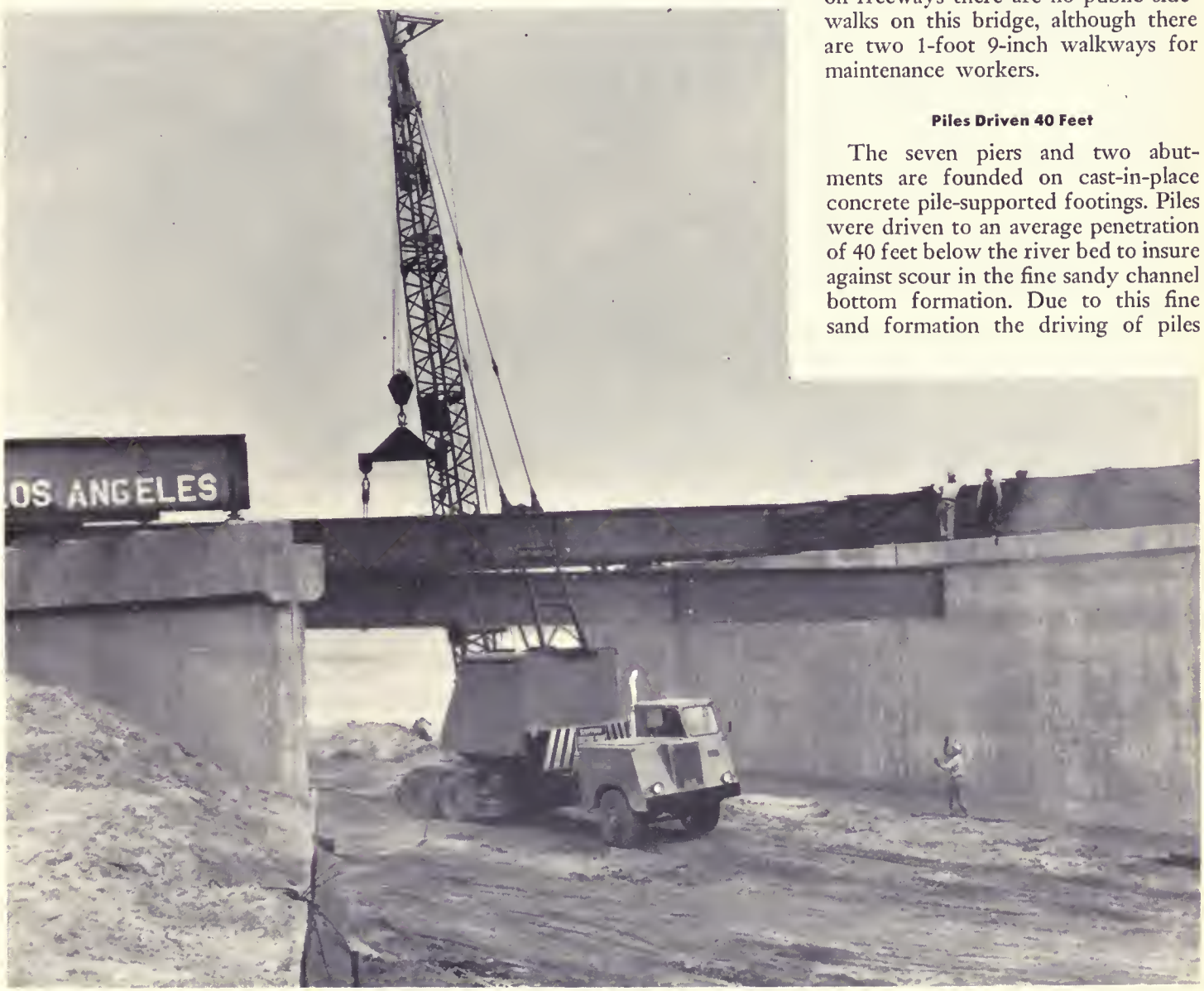
By J. M. CURRAN, Associate Bridge Engineer

LOCATED southeast of the City of Los Angeles and now under construction is the Rio Hondo Bridge, one of the comparatively few river bridges on our Southern California freeways. Considered along with the many undercrossings, overcrossings, and various other freeway structures, this bridge has the unusual distinction of carrying the Santa Ana Freeway over a river.

One-half of the bridge is on tangent, the other half is on a 3,000-foot radius curve. All piers are parallel to the ultimate alignment of the improved Los Angeles County Flood Control channel of the Rio Hondo and, as a result, the piers are skewed approximately 26 degrees.

The bridge is a steel girder structure 635 feet long consisting of seven 83-foot spans and one 52-foot span. A bridge roadway 88 feet wide provides two 40-foot wide roadways, and an 8-foot median or dividing strip, to carry the six traffic lanes of the freeway. Since pedestrians are not allowed on freeways there are no public sidewalks on this bridge, although there are two 1-foot 9-inch walkways for maintenance workers.

Erecting steel beams on span seven. Photo by Ray Graham, Los Angeles Times



Piles Driven 40 Feet

The seven piers and two abutments are founded on cast-in-place concrete pile-supported footings. Piles were driven to an average penetration of 40 feet below the river bed to insure against scour in the fine sandy channel bottom formation. Due to this fine sand formation the driving of piles



Erecting steel beam in span seven. Photo by Ray Graham, Las Angeles Times

was very difficult and jetting of piles was required for almost their entire penetration.

The designers of the bridge specified unusual welding methods to meet the design requirements of the 83-foot long spans by using transformed rolled steel beams rather than by using conventional fabricated steel plate girders. Plate girder utilization would have been more expensive and would have required a greater amount of critical steel. Standard 36-inch WF 280-lb. rolled steel beams were split horizontally along the centerline of the beam, the two sections were then spread apart and a 12-inch-wide filler plate was then welded between the two sections, and a 48-inch depth of beam resulted.

Cutting and Welding Beams

The process of cutting and welding the beams is of particular interest and shows careful planning on the part of the engineers of the Union Steel Company. The rolled sections are first laid flat on a table jig. A radiograph cutting torch, guided from the flanges, then moves from one end of the beam to the other behind a water bath, splitting the beam accurately down the centerline in two T sections. Frequently the releasing of "locked in" stresses during splitting operations caused the two longitudinal sections to spring apart as much as eight feet at one end while remaining closed at the other, or the same operation would cause the beam sections to bow apart at the center while remaining closed at the ends, or in some cases no apparent deformation took place.

After the beams are split they are then placed on a specially designed jig carriage where the two sections are realigned with clamps and jacks and the 12-inch plate is inserted and tackwelded into proper position. Splices in the filler plate are made at the quarter points of the beam. The

jig carriage then passes at a predetermined speed beneath a two-arc automatic welding machine using 5/32-inch rod in the submerged melt welding process.

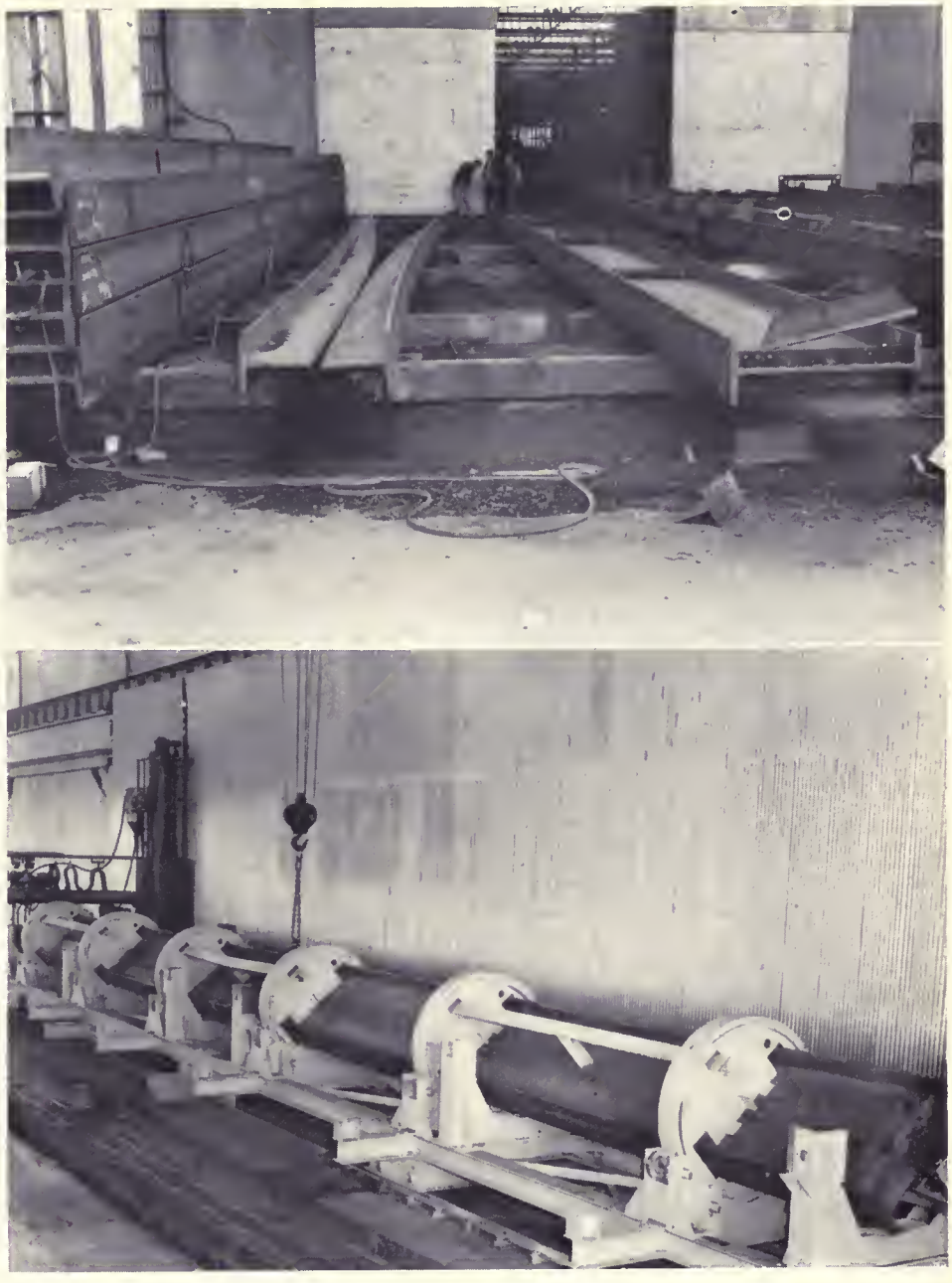
Jig Carriage

The jig carriage is so designed that when the double weld has been completed on one side, the upper gates of the circular holding devices on the rig are closed and locked and the whole carriage is rotated through 180 degrees so that the other side of the girder flange is up. The carriage then returns under the welding machine, repeating the welding process previously used, thus completing the weld on the second side. The welds are then X-rayed to determine the quality and penetration of the weld before moving the beams from the shop to the bridge site. Steel fabrication and X-ray inspection of the welds were under the supervision of Ross Clinton of the Materials and Research Department of the State Division of Highways.

Truck and trailer combinations moved the beams from the shop of the Union Steel Company to the bridge site where truck-mounted cranes moving across the river bottom, which is dry except during storm periods, lifted the beams into final position on the piers. A simple diaphragm and stiffener system, riveted in place in the field, insured a rigid steel floor system. Forms for the reinforced concrete roadway deck, which are now in the process of being fabricated in place, are supported from the lower flanges of the steel beams in a conventional manner.

This bridge was designed and is being constructed by the Bridge Department of the State Division of Highways under the general supervision of F. W. Panhorst, Assistant State Highway Engineer, Bridges, with J. W. Green, Southern Bridge Department Representative, J. M. Curran, Bridge Department Representative on the project, and J. C. Allison, principal assistant.

It is being constructed at a cost of approximately $734,750 as a part of the highway and bridge contract totaling $2,537,790 awarded to United Concrete Pipe Corporation on August 21, 1951. The Contractor's Project Manager is Jack Yount, the Superintendent is Carl Rice, and the Structures Superintendent is Charles Leedham. Steel fabrication and erection were performed under subcontract by the Union Steel Company of Los Angeles with Peter Delabout, Vice President in charge of production and Hal Lees, Chief Engineer.



UPPER—Deformation of beam sections caused by release of "locked in" stresses during splitting operations. LOWER—Jig carriage closed and being revolved to turn beam over so other side can be welded. Photos by R. J. McDonald of Union Steel Co.

DRINKING AND DRIVING

Drinking when planning to drive is a serious violation of both common sense and common decency. Alcohol when taken into the system even in small quantities can cause drivers to take those long chances that so often lead to serious accidents.

FOREIGN CAR RECORD

A grand total of 3,374,920 motor vehicles entered California through state border quarantine stations during the year 1952, reports the National Automobile Club. Of this total, 3,067,554 were automobiles, 266,977 were commercial trucks, and 40,389 were busses.

Anderson Study

Retail Business on Frontage Road Shows an Increase of 61 Percent

By JOHN F. KELLY, Headquarters Right of Way Agent

THE FIRST economic study of a frontage road where there has been an opportunity to make a direct comparison within the same community between two separate retail areas has been completed by the Right of Way Department, Division of Highways.

Although their physical appearance differed because of the arrangement of the buildings, both retail areas were subjected to the same general economic influences. The construction of the new expressway through Anderson, Shasta County, in 1950, required one of these retail areas to be moved and placed on a frontage road, whereas the other area was unaffected by the new highway construction.

The accompanying chart shows the layout of the town in relationship to the retail and residential areas. It will be noted the highway and the railroad divide the town of Anderson into an east and west side, and that residential and retail development lie on both sides of the division. This plans shows the expressway and frontage road as they exist today.

Before the construction of the frontage road on the west, retail outlets on that side had unrestricted access to the through highway and had the appearance of a typical highway ribbon development. There were no established setbacks or designated parking areas, and the highway shoulder acted as a parking strip for shoppers as well as a sidewalk for pedestrian traffic.

Highway construction made a tremendous change in the appearance of the community and it is of particular interest because this transition took place entirely on the west side and did not alter the appearance, size or location of the business and residential areas on the east side.

Lumber Industry

Anderson has existed for many years as a small agricultural center with dairy farming providing the chief source of income to the community. The location of the town along the main route of the Southern Pacific Railroad and its close proximity to a large lumber empire has recently attracted a number of lumber enterprises to locate in the vicinity of Anderson. This industry has brought a new wealth into Anderson and it is becoming one of the primary sources of income to the community. Today Anderson boasts of 16 lumber mills which are employing between 1,900 and 2,300 people with some seasonal variation. The population of Anderson has grown from 1,200 in 1948 to 2,200 at the present time.

The growth of the community and increased highway traffic between Red Bluff and Redding necessitated the improvement of the highway conditions along this route. A four-lane divided expressway was constructed along the existing highway alignment through the center of Anderson and parallel with the west side of the Southern Pacific Railroad right of way. In addition to widening the existing highway alignment, a 32-foot frontage road was constructed along the west side and for the entire length of the expressway through Anderson. This frontage road extends a distance of 3,800 feet from South Street, the southerly limits of the town, to Briggs Street, the northerly termini of Anderson.

Attractive Improvement

Highway motorists and the local residents can readily see that the construction of the new expressway and frontage road have greatly improved the physical attractiveness and parking facilities along the old highway route. However, the final and most important test of the new highway improvement as far as the property owners and the community are concerned is whether the change has "paid off." Has it proved to be a worthwhile and profitable benefit to the property owners and merchants affected?

This economic study utilizes all of the available facts pertinent to a determination of the actual monetary effect on the town of Anderson by the elimination of direct access from properties adjacent to and fronting on U. S. Highway 99.

The largest available source of factual data was found relating to retail business. This one phase of the study is actually conclusive enough to use as the sole barometer for measuring the benefits of the highway change. It is the phase or activity in which the majority of affected property participates. It follows that the gains or losses made by the greatest number will produce a more reliable basis for analysis than the activity of only a few properties. However, all other available facts, regardless of how meager or fragmen-

PREVIEW OF STUDY

ANDERSON

Location—	12 miles south of Redding on U.S. Highway 99 in Shasta County
Population—	2,200
Two Retail Areas—	U. S. Highway 99 (now an expressway and frontage road)
	East Center St. (unaffected by new highway)

NEW EXPRESSWAY

Completed—	June, 1950
Type—	Four-lane divided expressway with a 32-foot frontage road on west side. Length 3,800 feet. Major intersections—north and south streets.
Property Affected—	23 parcels

ECONOMIC STUDY

Purpose—	To determine economic effect of controlled access and frontage road constructure in the community.
Scope—	Comparison of two years before with two years after expressway completed.

tary, have been made a part of this report so that nothing is omitted which might have an influence on the accuracy of this frontage road study.

RETAIL BUSINESS SURVEY

The retail business survey section of this study utilized the sales tax returns on gross retail sales as reported by each retail outlet to the State Board of Equalization. These returns are submitted to the State Board of Equalization over the sworn statements of the merchants as to their accuracy. With these reliable figures a "before and after" comparison was made to determine the percent of gain or loss. To obtain the relative effect of the gain or loss, it was then necessary to weigh these figures against a comparable situation for a like period of time.

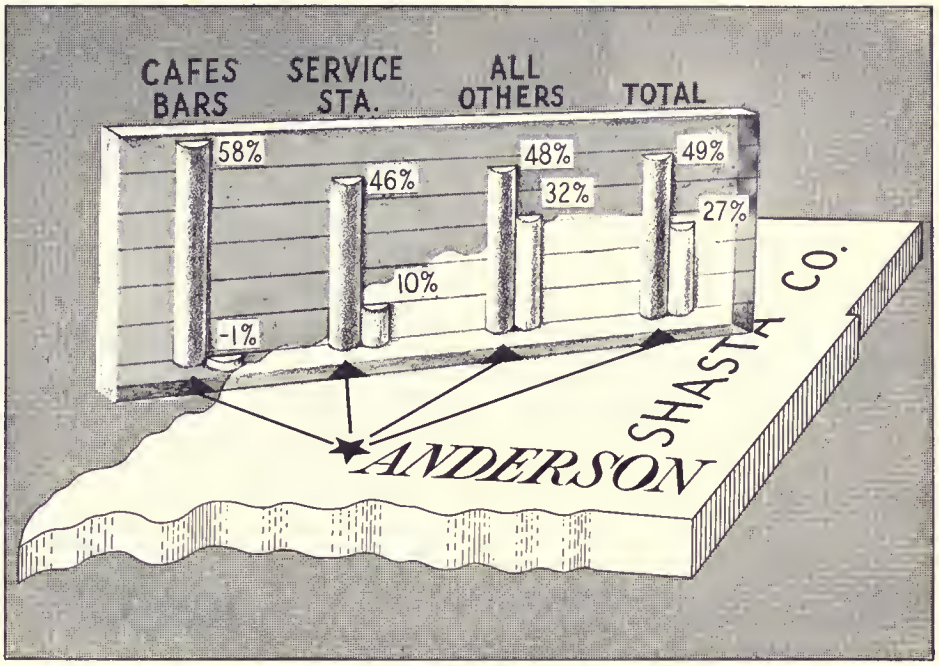
In this study two distinct comparisons were made. First, reported sales returns of all retail outlets in Anderson were compared with the sales reported by all retail outlets in Shasta County. This comparison was designed to show whether the retail business in Anderson is performing higher or lower than the average expectancy as indicated by the county. Second, in addition to the town and county comparison, this study offered the unique and interesting possibility of comparing all of the retail outlets of Anderson which were directly affected by the new highway with the retail outlets in the remainder of the town which were unaffected.

Study Covers Four Years

The time period for this economic study covered a total of four years, permitting a comparison of two years before the completion of the new expressway with the two years following that date. June 30, 1950, has been used as the highway completion date. It coincides closely with the date the new highway was dedicated and it is the most convenient date for analyzing the sales tax returns.

All sales tax figures have been calculated to the nearest one hundredth, but for discussion and exhibit purposes, the nearest whole figure has been used.

The percentages of gains or losses in the two charts showing retail business activity reveal the amount of gain or loss for the two years following the completion date of the new expressway as compared with the sales activity for the two previous years. For example, the accompanying chart shows two columns for total business activity. The Anderson column is marked 49 percent. This means that business in Anderson was 49 percent better during the two years after the expressway completion date than during the two years before.



The percentage increase or decrease in gross volume retail sales made during the two years after the expressway completion as compared with the two previous years in Anderson and Shasta County. Anderson sales shown on the left and Shasta County on the right in each pair of columns.

Segregation by Class

A segregation by class has been made because there are certain types of retail outlets such as cafes, bars, and service stations, which can be operated to derive a great deal of their business from the traveling public.

Making a separate study of those retail outlets which are most likely to be patronized by the highway motorist, we are able to see what the effect of the new highway construction has been upon this class.

The remainder of the retail outlets are grouped together under the title "all others." The retail outlets in this class are the ones which serve the needs of the community such as the grocery, drug, clothing, hardware, appliance and furniture stores.

ANDERSON ON TOP

Facts show Anderson gross sales higher than Shasta County for all types of retail outlets.

	Anderson	*Shasta County*
Total	49% gain	27% gain
Cafes and bars	58% gain	1% loss
Service stations	46% gain	10% gain
All others	48% gain	32% gain

The percentages in this table are shown in the above chart to portray the notable difference in volume of retail business performed by Anderson and Shasta County during the same period of time.

The pair of columns in the chart depicting total business activity reveal that all retail business in Anderson was 49 percent better during the two years after the opening of the new expressway as compared with the two years before. During this same period of time all retail business in Shasta County made gains amounting to 27 percent. Provided there are no unusual circumstances influencing the county sales activity, we can assume the increase in the volume of retail business of Shasta County is indicative of anticipated gains to be made by all retail business in this general area. From a percentage-wide standpoint, the business

gains made in Anderson were 79 percent greater than the gains made in Shasta County. This percentage does not appear on the chart, but has been calculated only to show how far the business gains in Anderson exceeded the gains of the county.

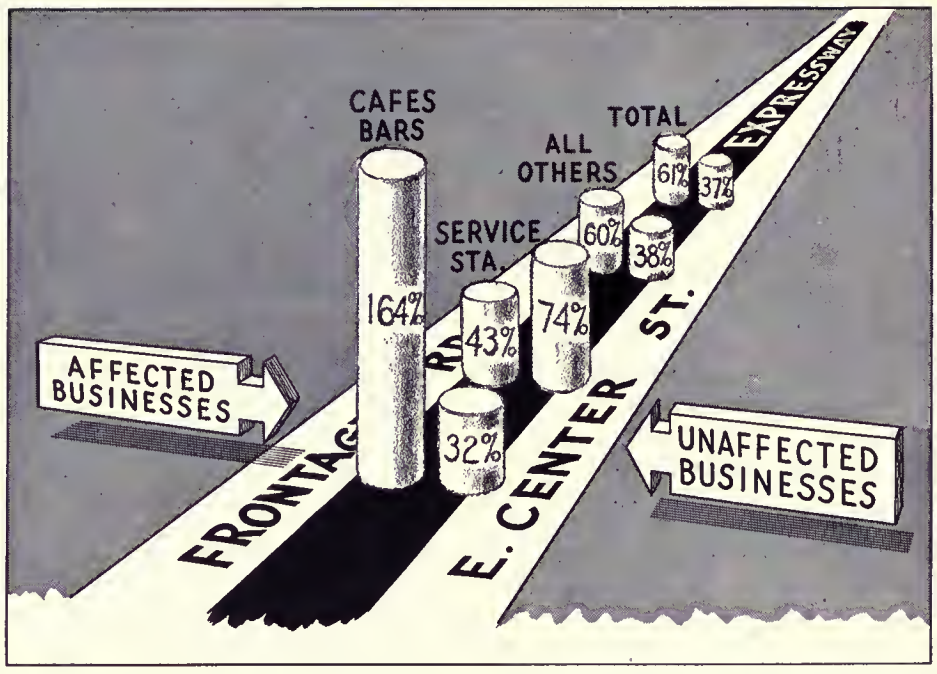
Purpose of Study

The active new lumber industry in Anderson has contributed a great deal to the retail gains made by this community. However, we cannot overlook the fact that other communities in Shasta County have also benefited by the growth of new industrial enterprises. Exactly how much these new industries are adding to the wealth of each community is not within the realm of this study. The purpose of this economic study is to determine how much the *new highway* has influenced the community and that property which is directly affected.

It may be questioned that the use of a direct comparison between Anderson and the County of Shasta is unwise for the reason that the new wealth brought to the community by the lumber industry is the major contributing factor and applies mostly to the town of Anderson. However, by the use of the second comparison which compares all of the retail business adjoining and directly affected by the new highway with the remaining business which was entirely unaffected, it is clearly reasonable to assume that both sections of Anderson would be subject to and affected by all contributing influences in a similar manner, and the major difference would be the highway influence.

Comparisons

If the near-by lumber industry increased the gross sales returns of the east side of Anderson, it follows that the west side would also enjoy this increase. The same condition would also apply to land values, in that if economic changes within the community created a greater demand for land on one side of Anderson it would create a similar demand on the other side. However, before going further into this comparison of one side of Anderson with the other, let us first review the comparison of the town of Anderson and Shasta County.



The percentage increase in gross volume retail sales during the two years after the expressway completion as compared with the two previous years on both sides of the highway in Anderson. The four columns on the right side of the chart along East Center Street reveal sales increases on the unaffected side and the four columns on the Frontage Road show the percentage increase on the affected side of the highway.

The facts reveal that the cafes and bars in Anderson made an increase in gross retail sales of 58 percent, whereas this same class of business throughout Shasta County suffered a loss of 1 percent in gross volume of retail business during the two years after the expressway completion date.

Service Stations Benefit

Going further into the activity of retail outlets most likely to be patronized by the highway motorist, let us look at the business gains made by service stations. The chart shows that in Anderson the service stations enjoyed a 46 percent increase in gross business. During the same two years after the expressway completion date, all service stations in Shasta County made a gain of 10 percent.

The wide range existing between Anderson and Shasta County in the retail sales activity of cafes, bars and service stations indicates that the change in the design of the highway through Anderson did not discourage the highway motorist from patronizing these businesses which cater to highway traffic.

"All Other" types of business in Anderson made retail gains amounting to 48 percent. This same group of retail outlets throughout Shasta County made an increase of 32 percent in the gross volume of retail sales.

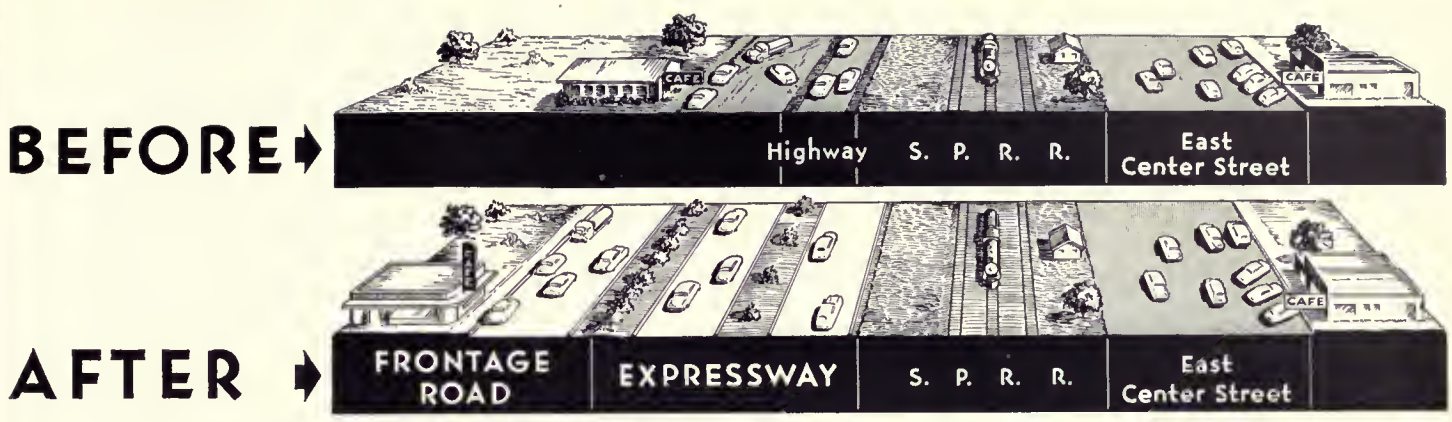
In a final review of the chart, we see something that is as impressive as the increased volume of retail sales. The over-all high business gains were not brought about by the spectacular or unusual activity of a small number of retail outlets; instead we find almost a uniform gain for all types of retail outlets, which is a healthy sign for the business activity of the community.

HIGHWAY INFLUENCE ON BUSINESS

Gross business volume of retail outlets on new frontage road makes an excellent record compared with similar properties which are unaffected by new highway construction.

	Affected business	*Unaffected business*
Total	61% gain	37% gain
Cafes and bars	164% gain	32% gain
Service stations	43% gain	74% gain
All others	60% gain	38% gain

To emphasize the differences in the gains made in gross volume of retail business, the percentage increases are shown on the accompanying chart.



The above perspectives of Anderson clearly illustrate the highway improvement on the west side of the railroad

East Center Street marks the location of those retail outlets which have been unaffected by the new highway construction. The four columns shown on this street depict the percentage gains made by all of the retail outlets; cafes and bars; service stations; and all other types of retail outlets. Frontage road shown on the left side of the chart marks the location of those retail outlets which were directly affected by the new highway construction. The percentage gains made by those retail outlets are shown on the four columns along the left side of the chart on the frontage road designation.

Effect of Access Restriction

This phase of the study gives a clear picture of exactly how much economic effect the restriction of access and the construction of the frontage road has had on those properties affected. The volume of gross business performed by the retail outlets on the frontage road is compared with their performance when they had full access on a through highway. The difference in performance of those retail outlets is compared with the before and after sales activity of all other retail outlets in the community which are unaffected by the new highway construction. The measure of benefit which has been added by reason of being on the new frontage road is the difference in the gains made by these two groups of retail outlets.

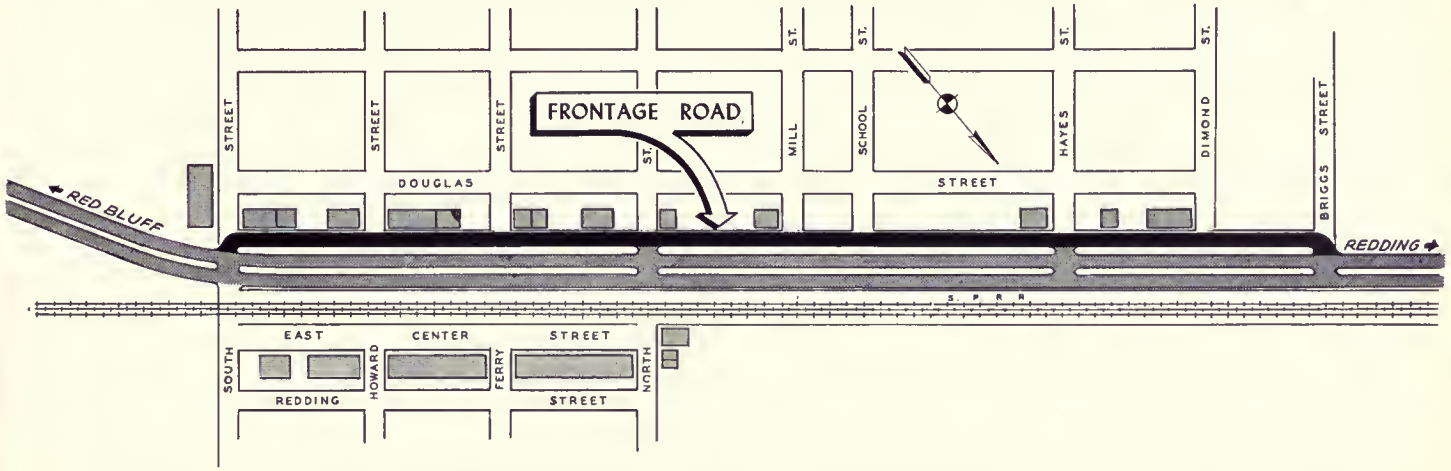
Retail Business Increase

There are 21 retail outlets on the frontage road and 24 on the unaffected side which report sales tax returns to the State Board of Equalization. Barber shops, dry cleaners, and other personal services do not report sales tax returns, so they are not included in this study.

The facts reveal that the total gross volume of retail business on the frontage road increased 61 percent during the two years following the opening of this new road. During the same period of time the retail outlets on East Center Street made a total increase in gross sales amounting to 37 percent. The differences in the gains made between the affected and unaffected sides show that retail business on the frontage road excelled by 63 percent the gains made by retail business which was subjected only to the normal economic influences of the community.

The chart shows that cafes and bars along the frontage road enjoyed an increase in gross retail sales amounting to 164 percent. At the same time, cafes and bars on the unaffected side had business increases amounting to 32 percent. The sales increases of the cafes and bars along the frontage road indicate that this particular type of business has benefited considerably from the new frontage road location.

This plan shows the new highway improvement through the center of Anderson. Shaded squores mork location of retail outlets on Frontage Road and East Center Street. Note four openings from expressway to Frontage Rood and two railroad crossings at North and South Streets to Eost Center Street.



What Chart Shows

The service stations on the frontage road made an increase in total retail sales of 43 percent. The single service station on the unaffected side shows an increase of 74 percent in gross retail sales. This is the only example of the entire study where the retail gains made on the frontage road have been lower than the gains on the unaffected side. It is also the only comparison between a group and a single retail outlet. An analysis of the service station sales is covered in the section of this study entitled "Service Station Survey."

The remainder of the retail outlets classified as "all others" on the chart show an increase in gross retail business amounting to 60 percent on the affected side and 38 percent on the unaffected side. This group of retail outlets represents the majority of the number of retail outlets and dollars spent within each particular retail area. The activity of this group of retail outlets more accurately portrays the status of business than any other group of retail outlets.

SERVICE STATION SURVEY

The factual study of retail sales volume which included service stations has been supplemented by a survey of the gallonage sales of all service stations in Anderson. These records reveal that gallonage sales of the six stations on the

UPPER—East Center Street in Anderson before new highway construction. LOWER—Some thoroughfare after completion of freeway.



frontage road have made an average increase of 16 percent during a six-month period of time after the completion of the new highway. The gallonage sales of the single service station on the unaffected side show an increase of 23 percent during a similar six-month period of study.

The six-month time base was used because it provided the greatest length of time that all service stations were in full operation for the same seasons of the year before and after construction of the new highway.

Although the time base is relatively short, it provides an accurate and interesting comparison of the gallonage sales for those stations formerly having unlimited access to the through lanes of traffic.

The single station on the unaffected side precludes the opportunity of making a fair comparison. Management, brand of gas, site distance, and a host of other factors have such a strong influence that any variation along these lines would upset the comparative base. This fact is obvious when a review of the gallonage sales along the frontage road reveals that one station had a gallonage increase of 4 percent and another gained 28 percent. It is only by having a sufficient number of outlets that a reliable average can be developed.

The 16 percent increase in gallonage sales by the six service stations on the frontage road is a very significant gain when compared with the 7.8 percent increase in gallonage sales made by all service stations throughout the State during the same six-month study period.

PROPERTY VALUATION

There has been very little real estate sales activity along the highway route through Anderson since the Division of Highways purchased the right of way for the new expressway and frontage road in late 1948 and early 1949. At that time, the State purchased a 63-foot strip of land across the front of 23 parcels adjoining the west side of U. S. Highway 99. This acquisition reduced the depth of the lots from 150 feet to 87 feet. Subsequently, the county abandoned 10 feet from the street in the rear of these parcels, thereby increasing the remaining lot depth to 97 feet.

There are not a sufficient number of sales to permit a definite analysis on exactly how much the real estate market has changed since the construction of the frontage road. However, a review of a few known facts leaves little doubt with respect to the confidence the local citizens have in the future of property along this street.

1. Highest price paid for a single piece of real estate in Anderson in the past two years was for a property located on the frontage road.
2. The few real estate sales on the frontage road have been in line with or slightly higher than sales of comparable property in the community.
3. There have been no sacrifice sales on the frontage road.
4. There have been several examples of property owners preferring to lease rather than to sell.
5. Smaller percentage of vacancies among improved properties on frontage road than on East Center Street.
6. Six new businesses have started on the frontage road since its construction.
7. No business failures since frontage road was built.

One definite conclusion can be made; property on the frontage road has not decreased in value.

ASSESSED VALUES

Although assessed values may not in some instances indicate the market value of real estate, they do reflect the opinions of value of the local authorities responsible for land valuation for tax purposes. It is therefore significant that the present assessed values of the land abutting the frontage road was increased 14 percent over and above the increase of similar properties on East Center Street.

The retail lots on East Center Street have a depth of 150 feet. The assessed value of inside lots having a 50-foot frontage on this street is 57 percent higher in 1952 than in 1948.

The retail lots on the frontage road *had* a depth of 150 feet in 1948; they have a depth of 97 feet in 1952. The assessed value of inside lots having 50 feet frontage on the frontage road is 71 percent higher in 1952 than in 1948, although they possess 33 percent less area than in 1948.

Because of the variation in the opinion of the values on corner lots, we did not use them for comparative purposes in this analysis. However, the corner lots on the frontage road would show a higher increase percentagewise in assessed value than the inside lots.

TRAFFIC

With the present highway facility the citizens are hardly aware of the growing traffic in their vicinity. Traffic counts indicate that on U. S. Highway 99 in 1947, 4,540 vehicles per day were passing through the Anderson area, whereas the counts in 1952 indicate a daily traffic count of 6,300. In other words, there is an increase of 38.8 percent of traffic since 1947. If this increase of traffic was using the former two-lane highway, the businesses facing the frontage road would now be in the same dilemma as many of California's cities in attempting to solve their traffic congestion problem.

It has been thoroughly proven that there is no direct relationship between the amount of traffic and the amount of business transacted. The only possibility of transacting business is when it is possible for the motorist to park his car to do his buying. With the frontage road, the businessmen of Anderson are now able to offer their buying public parking space and protection. Without the frontage road the motorist would not feel safe in stopping and would be subject to the usual high percentage of accident potential wherever conflicting traffic movements exist.

CONCLUSION

The factual information in this study clearly indicates that this frontage road is a benefit to the property affected and to the entire community.

Three important conclusions from this study are:

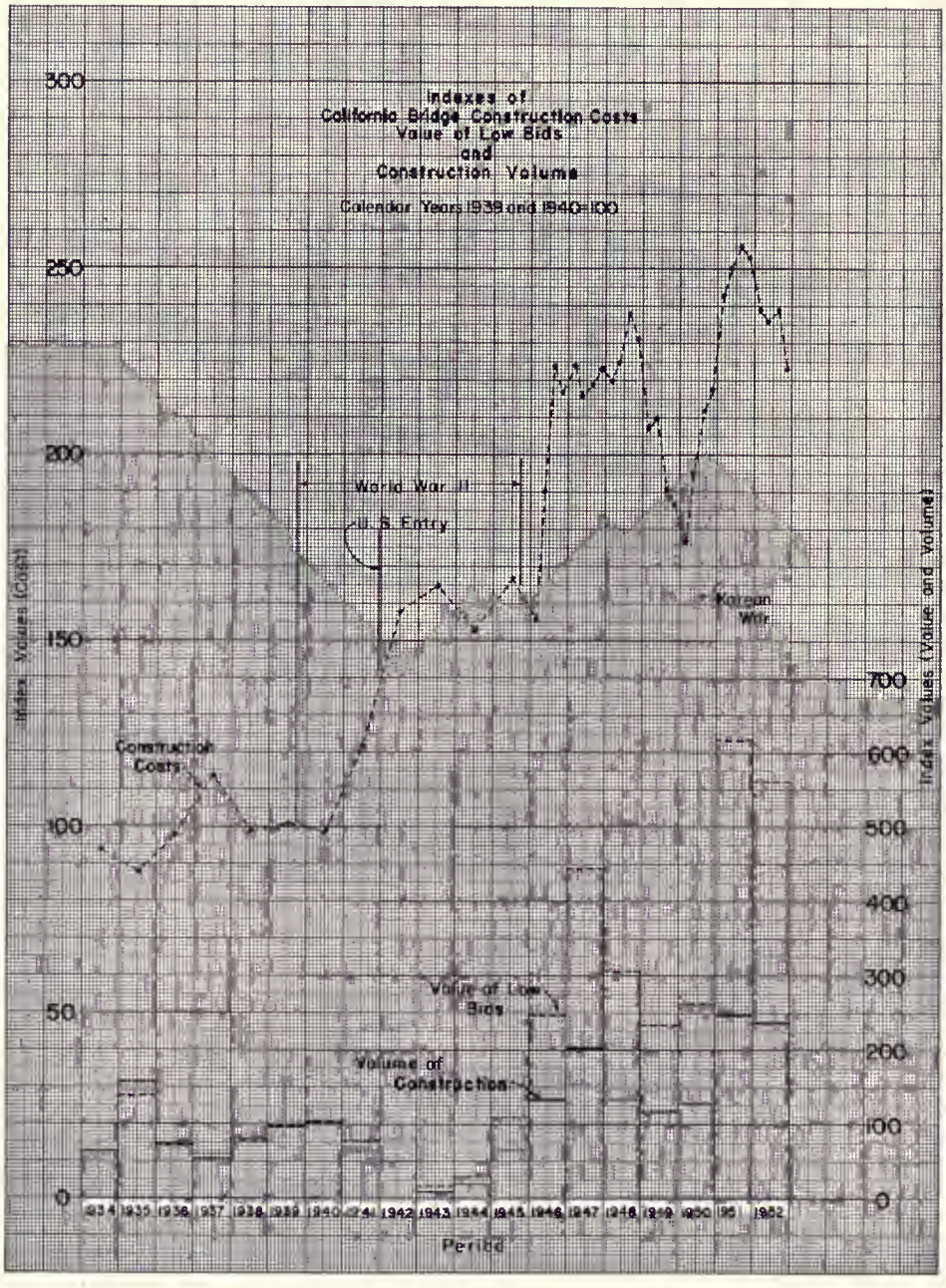
1. Retail outlets on the frontage road showed highest business gains in the community.
2. Frontage road has not been a detriment to property values; there are indications of an increase.
3. New frontage road improves the appearance of the community. Adequate area remaining on frontage road for future retail growth with no interference from increasing highway traffic.

California Bridges

Cost and Volume of Bridge Construction: 1934-1952

By J. S. McCLELLAND and W. J. YUSAVAGE
Junior Research Technicians, Bridge Department

The following article deals in detail with California highway bridge costs. For total highway costs of which bridge costs are but a portion, the reader is referred to a series of articles entitled *Highway Costs*, by R. H. Wilson, H. C. McCarty, R. R. Norton, and J. D. Gallagher in the January-February, 1949; July-August, 1950; March-April, 1951; July-August, 1951; November-December, 1951; May-June, 1952, and July-August, 1952, issues of *California Highways and Public Works*.



NATION-WIDE building and construction costs have undergone an almost continuous increase during the past 20 years. As reported in various construction cost indexes this upward trend varies with the general type of activity represented as well as the source and treatment of the underlying cost information.

The increasing importance of bridges —particularly freeway structures — in the state highway construction program has stimulated interest in the effect inflationary pressures have had locally upon the cost of this specific type of construction activity. As a result, a study of the actual costs to the State for bridge construction during the past 20 years was undertaken recently in the Bridge Department of the California Division of Highways. This study furnished the index values shown in the accompanying chart which indicates the relationship of California bridge construction costs during each calendar year 1934-45 and during each subsequent calendar quarter to the level of costs during the base period, the calendar years 1939 and 1940.

Determination of Costs

The cost to the State for bridge construction during a given period is measured by the cost of predetermined quantities of 14 contract items of work —employing weighted averages of the item unit prices found in all bids accepted during the given period. The cost of this fixed schedule of work during the period 1939-40 is assigned the index value 100 while the cost during each other period is expressed in an index value reflecting percent of the cost during the base period.

Each index value represents a level of costs for the entire period to which it relates. Following the common custom these values are joined in the chart by a "trend line" which, of course, does not serve to indicate the day to day movements of costs. The 14 items of work, which are listed in Table I, account for approximately 80 percent of the periodic outlay by the State for contracted bridge construction; the remaining 20 percent is accounted for primarily by lump sum items which are not adaptable to accurate periodic comparison. The contract item quantities of the fixed schedule represent actual usage during the base period; data for the two years 1939 and 1940 were employed in order to obtain a representative quantity relationship among the 14 items of work. These item quantities are reported in Table I along with the total cost of each item during the base period and the resulting weighted average item prices.

Value of Volume

In conjunction with the index of the cost of California bridge construction, two indexes of the value of awarded bridge work are shown in the chart. Total value of low bids on work proposals is reported in one index, while the value of low bids deflated to figures which would result from the use of base period prices is shown in the other. The latter serves in effect as an index of the volume of awarded bridge construction. Index values for the three indexes plotted in the chart are shown in Table II. Columns III, IV, and V report index values for the indexes of cost, value, and volume respectively, while Column VI reports the periodic dollar values of all low bids on bridge construction, including work not considered in the cost index.

Although the chart reports only yearly value and volume information, the indexes of these two measures were designed with a view to permitting comparison of information relating to periods of unequal length. This was carried out by basing the indexes upon the average quarterly information of the two-year base period, with which average quarterly information for other periods of one or more quarters can be readily compared. In these indexes the average quarterly information for the years 1939 and 1940 is given the index value 100; the index value for each other period is obtained from the ratio of average quarterly given period information to average quarterly base period information. The volume of bridge construction for a given period, as shown in the index reporting this information, is merely the ratio of the dollar value of low bids to the cost of bridge construction during the same period, presented in index form.

Trend Components

The effect of those general economic conditions which direct the course of nation-wide construction costs can be seen clearly in the trends of California bridge construction costs. Local conditions, however, contribute minor trends and influence the course of those trends introduced by the general situation. One such local condition is the volume of general construction activity in the State. The two peaks and the intermediate low point in the cost of California bridge construction during the period 1948-1951 are found to occur at the time of similar high and low points in the local volume of general construction activity. The seasonal trend of costs also agrees with the strong seasonality in the volume of local construction. This cost seasonality, although partially hidden by sharp general trends, is characterized by a peak of costs during the third quarter of each calendar year, a low during the first quarter, and a lesser tendency for the fourth quarter level to exceed that of the second quarter.

Generol Trend

The effect of nation-wide economic factors is shown in the index by the sharp rise of California costs at the onset of World War II which ended a period of stability in costs. By the end of 1942 costs had risen 60 percent from the prewar level to a point which marks the approximate center of fluctuations of costs during the remainder of the war. The very sharp rise of costs early in 1946 tells the story of the resumption of general construction activity following the removal of construction controls. In a period of six months costs went up nearly 40 percent to a level which held for approximately two years. A sudden peak occurring late in 1948 was followed by a decline in costs which did not halt until early in 1950 when, with the start of hostilities in Korea, the trend was reversed

TABLE I
TOTAL QUANTITIES, WEIGHTED AVERAGE PRICES, AND DOLLAR AND RELATIVE VALUES OF LOW BIDS FOR 14 PRINCIPAL ITEMS OF WORK IN CALIFORNIA BRIDGE CONSTRUCTION CALENDAR YEARS 1939 AND 1940

Items of work	Total base period contract quantities	Weighted average prices	Dollar values of base period low bids	Relative values
Structure excavation	156,286 cubic yards	$1.56	$244,398.00	3.24%
Class "A" portland cement concrete (structure)	176,634 cubic yards	18.42	3,252,837.00	43.13
Class "A" portland cement concrete (footing block)	12,774 cubic yards	12.04	153,745.00	2.04
Structural steel (plate girder)	5,810,000 pounds	.077	450,221.00	5.97
Structural steel (rolled beam)	4,953,000 pounds	.063	310,900.00	4.12
Structural steel (truss)	7,884,000 pounds	.099	782,269.00	10.37
Miscellaneous iron and steel	766,630 pounds	.138	105,639.00	1.40
Bar reinforcing steel	35,958,000 pounds	.040	1,440,424.00	19.10
Furnishing steel piling	79,329 linear feet	1.79	142,168.00	1.88
Furnishing concrete piling	146,861 linear feet	1.60	235,477.00	3.12
Driving steel piling	2,313 each	25.29	58,490.00	.78
Driving concrete piling	3,781 each	40.84	154,411.00	2.05
Steel bridge railing	21,709 linear feet	5.93	128,798.00	1.71
Concrete bridge railing	42,976 linear feet	1.91	82,190.00	1.09
			$7,541,967.00	100.00%

and in a period of 18 months costs rose nearly 45 percent to an all time high of 256 on the index scale. Since the peak during the third quarter of 1951, California bridge construction costs have undergone a significant decline—a decline which can be attributed largely to local conditions in view of the continued upward trend, reported by the Bureau of Public Roads, in the nationwide cost of highway structures.

Inspection of cost data for the 14 items of work entering into the computation of California bridge construction costs shows that the contract item portland cement concrete (structure) —the item accounting for the greatest outlay—has had the greatest inflationary effect upon bridge construction costs. Reinforcing steel and structural steel, in that order, have shown lesser increases in cost, while furnishing and driving steel and concrete piling have, among the major items, shown the smallest increases. Although information obtained from the contract prices of proposed work items does not lend itself to a consideration of the underlying elements of cost, it may be noted that the greatest increases in cost are found in those items of work requiring the greatest relative amount of labor in the field.

TABLE II

INDEXES RELATING TO CALIFORNIA BRIDGE CONSTRUCTION AND PERIODIC DOLLAR VALUES OF LOW BIDS ON CALIFORNIA BRIDGE CONSTRUCTION

I Year	II Quarter	III Index of the cost of California bridge construction (1939-1940=100)	IV Index of the value of California bridge construction (1939-1940=100)	V Index of the volume of California bridge construction (1939-1940=100)	VI Dollar value of low bids on California bridge construction (in millions of dollars)
1934	.....	94	60 *	64 *	3.1
1935	.....	88	138 *	157 *	7.1
1936	.....	98	72 *	73 *	3.7
1937	.....	114	60 *	53 *	3.1
1838	.....	99	78 *	79 *	4.0
1939	.....	101	99 *	98 *	5.1
1940	.....	99	101 *	102 *	5.2
1941	.....	122	78 *	64 *	4.0
1942	.....	158	80 *	50 *	4.1
1943	.....	165	16 *	9 *	.8
1944	.....	153	29 *	19 *	1.5
1945	.....	167	109 *	65 *	5.6
1946	1st	156	342	219	4.4
1946	2d	190	247 * 295	133 * 155	12.7 3.8
1946	3d	224	148	66	1.9
1946	4th	217	202	93	2.6
1947	1st	224	280	125	3.6
1947	2d	216	443 * 629	202 * 291	22.8 8.1
1947	3d	219	450	206	5.8
1947	4th	223	412	185	5.3
1948	1st	220	233	106	3.0
1948	2d	225	307 * 365	134 * 162	15.8 4.7
1948	3d	238	381	160	4.9
1948	4th	231	249	108	3.2
1949	1st	207	186	90	2.4
1949	2d	210	233 * 342	117 * 163	12.0 4.4
1949	3d	191	194	102	2.5
1949	4th	187	210	112	2.7
1950	1st	177	124	70	1.6
1950	2d	195	262 * 357	129 * 183	13.5 4.6
1950	3d	212	171	81	2.2
1950	4th	218	396	182	5.1
1951	1st	243	528	217	6.8
1951	2d	250	617 * 948	247 * 379	31.8 12.2
1951	3d	256	598	234	7.7
1951	4th	253	396	157	5.1
1952	1st	239	396	166	5.1
1952	2d	236	561 * 1,017	237 * 431	28.9 13.1
1952	3d	239	652	273	8.4
1952	4th	223	179	80	2.3

* Average quarterly information.

Prospects

As of the fourth quarter of 1952, California bridge construction costs stand at a level approximately 13 percent below the 1951 peak. The significant decline of costs during the past 15 months has carried the present level somewhat below that of the temporary 1948 peak. This decline, occurring without benefit of comparable reductions in the cost of materials and labor, has accompanied the appearance of a stronger competitive attitude as well as increased confidence in the possibility of avoiding undue hindrance from intangible factors such as the delays in obtaining materials, the scarcity of experienced labor, and the general uncertainty about future conditions which accompanied the first year of the Korean War. The local situation at present offers little evidence of an immediate resumption of the strong upward trend, barring a sharp increase in construction activity or other unforeseen conditions on the national level.

PHOTO BY NICKERSON

8 San Miguel Drive
Chula Vista, California

Editor

DEAR SIR: I find the magazine highly interesting and valuable. The cover photos are always attractive but I thought the November-December cover by Mr. Nickerson was especially outstanding.

Yours very truly,

H. W. ROCHE

In Memoriam

HERBERT L. COOPER

The passing of Herbert L. Cooper and his wife, Margaret, was received with deep regret and shock by their many friends following a head-on collision on the highway in the vicinity of San Ardo, Monterey County, on December 29, 1952.

The Coopers had been visiting during the Christmas holidays in the San Luis Obispo area where, in serving the Highway Department for many years in responsible supervisory capacities, he had enjoyed the respect and friendship of not only his co-workers, but also of many residents in the community.

Herb, while born in Chicopee, Mass., and graduating from Lehigh University, moved to California shortly after World War I and soon joined the State Division of Highways where, over the years, he worked in several parts of the State and advanced to important assignments which he carried out with honor to himself and the department.

For the last seven years before his retirement in August, 1952, he represented headquarters throughout the several districts and was always a welcome source of assistance and informatian to the many with whom he came in contact. As a vindication of Herb's sterling character, he had suffered poor health for many years, however, his physical discomfort was never a source of complaint nor did he allow it to affect his work or associations with others, which were manifested by his ever cheerful and friendly disposition.

"Herb" and "Peg" Cooper made a host of friends wherever they went throughout the State, and these friends have been deeply saddened and shocked by their sudden passing.

In Memoriam

SPENCER W. LOWDEN

Death has taken Spencer W. Lowden, one of the pioneer engineers of the Division of Highways. Mr. Lowden died in San Bernardino, which was his headquarters as District Engineer of District VIII, on January 13th. Death was preceded by a heart attack.

Mr. Lowden was born at Lowden's Ranch, Trinity County, April 27, 1888, the grandson of California pioneers who crossed the plains from Illinois to Sacramento in 1848-49.

After studies at St. Mary's College and Vander Naillen's School of Engineering in Oakland, he engaged in engineering work on roads and railroads in Northern California.

He entered the service of the California Highway Commission on April 3, 1912, at Redding, as rodman, and rose through the ranks to the position of District Maintenance Engineer of District II, with headquarters at Redding.

On September 8, 1933, he was promoted to Acting District Engineer and subsequently to District Engineer of District IX, with headquarters at Bishop. At that time he assumed responsibility for the improvement and maintenance of 824.7 miles of state highways in Inyo and Mono Counties and the eastern portion of Kern County, including 338 miles of county roads added by the Legislature to the State Highway System in the district that same year, many of which were dirt or gravel roads.

For the next 17 years he continued to improve the state highways which are the lifeline of the region, and which now total 954.6 miles for the district. Among the mountain passes traversed by the state highways in the district is Conway Summit on U. S. 395, the highest (8,136 feet) pass kept open all year round by the State Division of Highways.

Mr. Lowden worked successfully with the people of his district and with their local governmental agencies, and became a community leader in his home town of Bishop, where he was an active member of the Elks and Masonic Lodges and the Rotary Club.

On October 1, 1950, he was transferred to larger responsibilities as District Engineer of District VIII, San Bernardino, where he continued to serve until his death. In the past few years in District VIII he was in charge of the development of U. S. 395 to multilane divided standards, the planning and construction of the eastern portion of the Ramona Freeway, and the improvement of many routes serving the communities of San Bernardino County and the western half of Riverside County.

He is survived by his wife, Mrs. Mildred Lowden of San Bernardino; by his daughters, Mrs. Margaret Young of Reno and Miss Patricia Lowden of San Bernardino; by his son, Earl Lowden of Bishop; and by three grandchildren, Vicki, Jacqueline, and Robert Lowden of Bishop. He is also survived by three brothers, P. R. Lowden of Marysville; Henry Lloyd Lowden and E. H. Lowden, both of Redding; by two sisters, Mrs. Marian Gilfillan of Visalia and Mrs. Kathleen Roberts of Claremont; and by his aunt, Mrs. Nellie Hollingsworth of Redding.

McNeely Takes Over District Post of Spencer Lowden

STATE Highway Engineer George T. McCoy on January 15 appointed L. R. McNeely Acting District Engineer of District VIII of the Division of Highways pending the naming of a permanent successor to the late Spencer W. Lowden. District VIII, with headquarters in San Bernardino, administers state highways in San Bernardino and part of Riverside Counties.

Mr. Lowden, a long-time employee of the Division of Highways, died January 13 after a brief illness. McNeely served under him as Assistant District Engineer in charge of operations.

Funeral services were held for Mr. Lowden in Redding, Shasta County, on Monday, January 19.

Uncontrolled Access

Control Eliminates Serious Accidents

THE ACCOMPANYING before and after accident diagrams show the very favorable results obtained by the elimination of uncontrolled access at the Nut Tree Restaurant near Vacaville, on U. S. Highway 40 in Solano County.

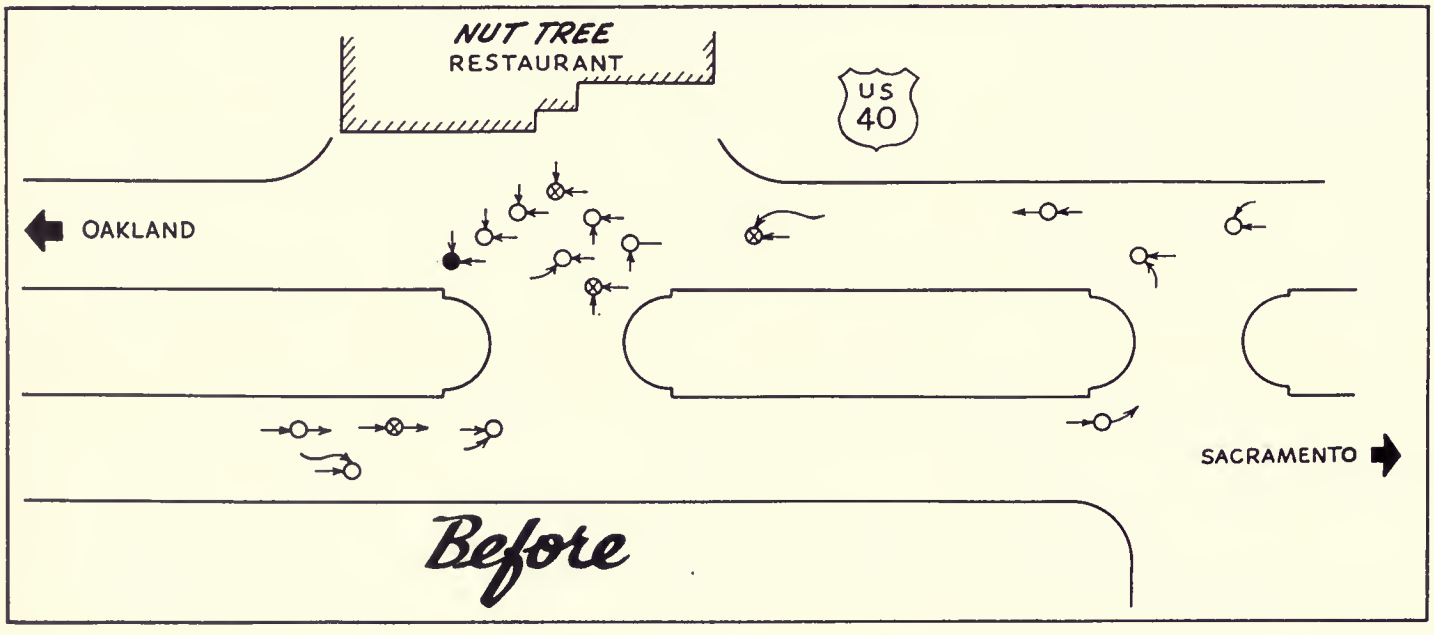
In the two years preceding the improvement, there was a total of 17 accidents at this location. This total included one fatal and four other injury accidents. The majority of the accidents were due to indiscriminate parking and careless movements to and from these parked positions. The numerous trees which obscured the view of the entrance and crossover were a contributing factor. A sudden decision to stop when opposite the restaurant, accompanied by a quick deceleration or lane change, was the cause of five accidents pictured.

The improvement consisted in the construction of a frontage road with cyclone fencing to separate parking maneuvers from the through traffic lanes. The existing crossover was closed



This photo shows haphazard parking movements at Nut Tree adjacent to U. S. 40 before improvement

This accident diagram is for two years before June 17, 1951. Each arrow represents a vehicle and its direction of travel. Each open circle is a property damage accident; crossed circle, an injury accident; and filled circle, fatal accident.





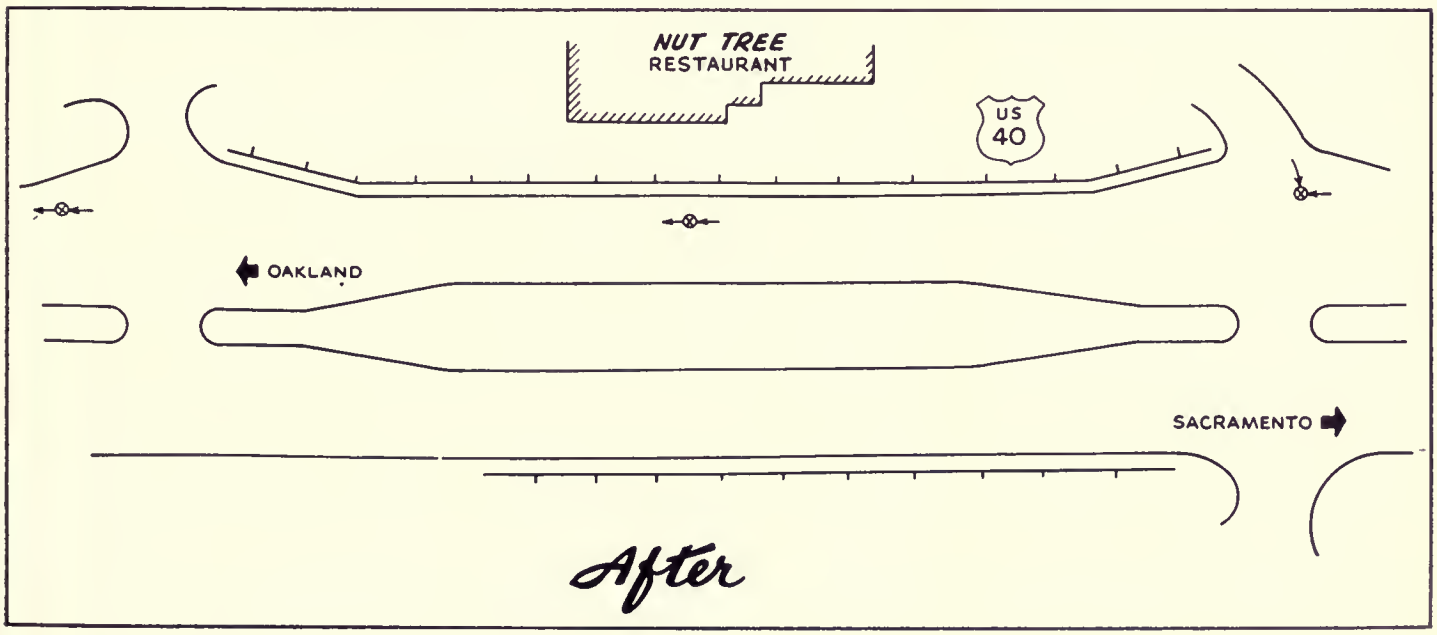
Photograph of completed project, showing control of entrance and exit movement

and new entrances were provided approximately 500 feet on either side.

In the year and one-half since the completion of the improvement on June 17, 1951, there has been only one accident involving access to the Nut Tree. The two rear-end accidents shown occurred within the project limits but involved only through vehicles on the highway.

Total cost of the project was $28,845. Savings to the traveling public due to the sharply reduced accident rate have to date, by any yardstick, approximated this cost. Expanding traffic volumes in the years ahead should reap increasing benefits from this improvement.

Accident diagram for 1½ years after June 17, 1951. Each arrow represents a vehicle and its direction; each crossed circle is an injury accident.



Cost Index

California Highway Construction Costs Show Small Variations

By RICHARD H. WILSON, Assistant State Highway Engineer; H. C. McCARTY, Office Engineer; JOHN D. GALLAGHER, Assistant Office Engineer

HIGHWAY construction costs in California at the end of 1952 were 7.8 percent lower than during the last quarter of 1951 as indicated by the California Highway Construction Cost Index, even though there was a rise of 2.3 percent during the fourth quarter of 1952.

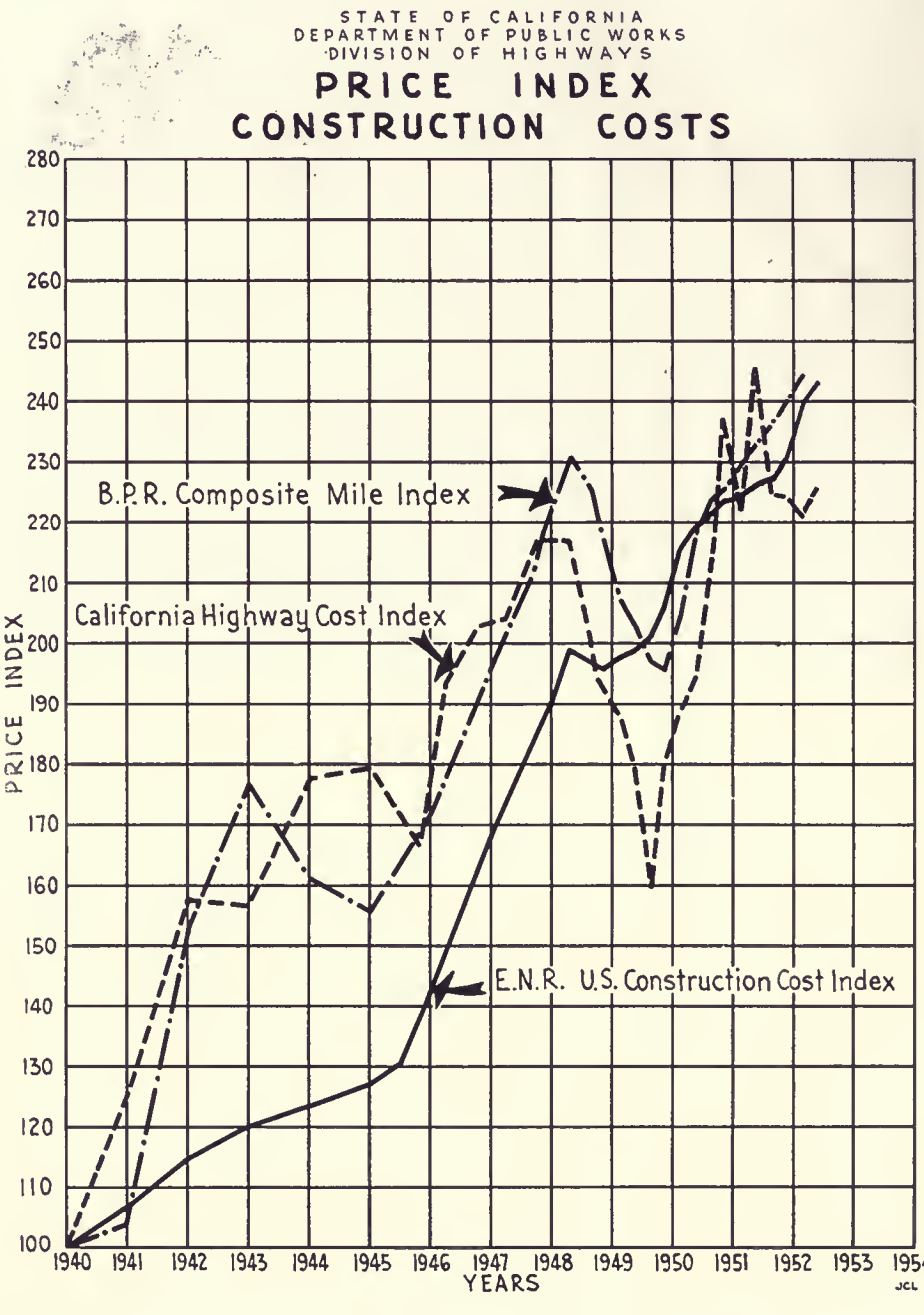
A year ago the index had reached an all-time high of 245.4 (1940 = 100) during the fourth quarter of 1951.

During the first quarter of 1952, however, the index fell off to 224.8, a drop of 8.4 percent.

During the second and third quarters it stood at 224.4 and 221.2 respectively. The 221.2 in the third quarter was the low for the year (9.9 percent below the last quarter of 1951) as the index rose 2.3 percent during the fourth quarter of 1952 to 226.2, which is only slightly higher than the first quarter of the year.

The static condition of highway construction costs in California during the entire year of 1952 may be the result of local trends, as on a nation-wide basis both the Engineering News-Record Construction Cost Index and the U. S. Bureau of Public Roads Composite Mile Index held to a slow but steady rise throughout the year.

It is felt that the limitation in down and up variations of the California Index during 1952 may be an indication that the upward spiral of highway construction costs has slowed down, but, with continuing increases in labor and materials costs, there appears little possibility of declining costs. However, many economic analysts throughout the nation are predicting in periodicals and on the air that prices will be lower in 1953.



There is nothing in the movements of the California Index during 1952 to support this opinion. It is anticipated that in the first quarter of 1953 the California Highway Construction Cost Index will drop slightly, but as contracts are put under way during subsequent quarters it is expected the Index will rise.

The accompanying graph shows the comparative fluctuations of the California Highway Construction Cost Index, the Engineering News-Record Construction Cost Index and the Bureau of Public Roads Composite Mile Index all reduced to a common base of 1940 = 100.

The following tabulation shows the

FIRST SECTION OF LONG BEACH FREEWAY OPENED TO TRAFFIC



Ribbon cutting. From left to right: County Supervisor Raymond V. Darby; Paul O. Harding, Assistant State Highway Engineer in charge of District VII; Spencer Cortelyou, Assistant State Highway Engineer, retired; R. M. Gillis, Deputy State Highway Engineer; Harrison R. Baker, member California Highway Commission; Burton W. Chace, Mayor of Long Beach; Albert G. Davis, President Long Beach Chamber of Commerce; H. R. Klocksiem, Assemblyman; W. S. Grant, ex-Assemblyman

Year	Cost index	Year	Cost index
1940	100.0	1950 (2d quarter)	180.0
1941	125.0	1950 (3d quarter)	189.2
1942	157.5	1950 (4th quarter)	194.8
1943	156.4	1951 (1st quarter)	215.4
1944	177.8	1951 (2d quarter)	238.3
1945	179.5	1951 (3d quarter)	221.9
1946	179.7	1951 (4th quarter)	245.4
1947	203.3	1952 (1st quarter)	224.8
1948	216.6	1952 (2d quarter)	224.4
1949	190.7	1952 (3d quarter)	221.2
1950 (1st quarter)	160.0	1952 (4th quarter)	226.2

California Highway Construction Cost Index by years from 1940 to 1949 and by quarters from 1950 through 1952.

The accompanying tabulation of average contract prices for the eight construction items on which the California Index is based covers the same period as the tabulation of the index itself.

CALIFORNIA DIVISION OF HIGHWAYS
AVERAGE CONTRACT PRICES

	Roadway excavation, per cu. yd.	Crusher run base, per ton	Plant mix surfacing per ton	Asphalt concrete pavement per ton	PCC pavement per cu. yd.	PCC structures per cu. yd.	Bar reinforcing steel per lb.	Structural steel per lb.
1940	$0.22	$1.54	$2.19	$2.97	$7.68	$18.33	$0.040	$0.083
1941	0.26	2.31	2.84	3.18	7.54	23.31	0.053	0.107
1942	0.35	2.81	4.02	4.16	9.62	29.48	0.073	0.103
1943	0.42	2.26	3.71	4.76	11.48	31.76	0.059	0.080
1944	0.50	2.45	4.10	4.50	10.46	31.99	0.054	0.132
1945	0.51	2.42	4.20	4.88	10.90	37.20	0.059	0.102
1946	0.41	2.45	4.00	4.68	9.48	37.38	0.060	0.099
1947	0.46	2.42	4.32	5.38	12.38	48.44	0.080	0.138
1948	0.55	2.43	4.30	5.38	13.04	49.86	0.092	0.126
1949	0.49	2.67	4.67	4.64	12.28	48.67	0.096	0.117
1st quarter, 1950	0.34	2.22	3.65	3.74	.....	40.15	0.077	0.081
2d quarter, 1950	0.40	2.13	4.48	3.74	10.86	43.03	0.080	0.105
3d quarter, 1950	0.41	2.32	4.25	5.50	10.91	44.34	0.093	0.131
4th quarter, 1950	0.42	2.81	4.64	4.61	12.55	43.18	0.098	0.120
1st quarter, 1951	0.45	3.07	4.06	5.22	11.71	46.38	0.103	0.206
2d quarter, 1951	0.63	3.88	4.56	4.63	12.93	51.50	0.105	0.166
3d quarter, 1951	0.56	2.88	4.59	3.90	12.41	46.14	0.107	0.165
4th quarter, 1951	0.66	2.91	5.66	4.89	12.71	49.38	0.105	0.169
1st quarter, 1952	0.56	3.25	4.88	4.77	14.25	47.46	0.094	0.152
2d quarter, 1952	0.53	3.19	5.29	4.13	14.20	49.12	0.091	0.143
3d quarter, 1952	0.55	2.61	5.49	4.60	12.80	48.21	0.094	0.132
4th quarter, 1952	0.66	2.68	4.97	.....	12.53	48.45	0.094	0.128

THE FIRST section of the Long Beach Freeway was officially put in operation the morning of December 10, 1952. Being 2.3 miles long, running from Pacific Coast Highway to 223d Street, the first section will relieve part of the congestion in Long Beach.

Separation structures have been built at Pacific Coast Highway and at Willow Street on the new highway. The City of Long Beach is building a connecting link from Pacific Coast Highway to its waterfront.

Contracts have been let for the building of structures and the grading and paving of the second section—which should be opened late in 1953.

HIGHWAY GAMBLERS

Many drivers would be offended if they were told they were gamblers, says the California State Automobile Association. Yet the chances they take in traffic are clear examples of betting with their lives for a slight advantage. It doesn't pay to take chances in the traffic game where life or death may be at stake. Take it easy and live longer.

Gaviota Tunnel

Continued from page 14 . . .

blower. An average round resulted in approximately 80 cubic yards of rock being removed from the face of the heading, which was loaded into Euclid dump trucks by means of an Eimco 1½ cubic yard overshot loader and hauled to the embankment areas. Upon completion of the mucking operation, the nine-segment arch was erected.

The timber sets were tied together with 6-inch x 8-inch collar braces and ¾-inch tie bolts to provide a stable support. The tie bolts will remain to replace reinforcing steel in the concrete arch lining while the collar braces will be removed prior to the lining operation.

After the heading was advanced for a distance of approximately 120 feet, the formation encountered indicated the tunnel would require supports throughout. In order to decrease the amount of excavation and the time required for placing of the supports, it was decided to take advantage of a supply of 42-pound 10-inch x 10-inch steel "H" bearing piles made available by the California Division of Highways. Instead of the nine-segment timber arch sections used in the first 120 feet, the steel arch sections were fabricated in two segments, each 25 feet in length along the arch.

Steel Supports Used

Driving of the tunnel continued in the above described manner with the wall plate drifts being advanced ahead of the main heading for the purpose of placing the new steel wall plates. The bottom flange of the steel arch sections was bolted to the steel wall plates as were the two segments at the crown of the tunnel.

The use of steel instead of timber supports resulted in substantial saving of tunnel excavation and lining due to the fact that the steel could be incorporated in the concrete lined section whereas the timber sets were placed outside of the lined area. Erection of the steel sets on five-foot centers could be accomplished in approximately half the time required to install the timber sets on four-foot centers.

Driving of the tunnel was completed for the timber and steel supported sections in much the same manner. For the entire length of the 385-foot heading, three locations were encountered where the formation was sufficiently stable to permit elimination of the wall plate drifts for an accumulated distance of 83 feet. Two hundred thousand board feet of lagging timber and 20,000 wedges were used in the process of construction.

Left Drift Holed Through

On February 6, 1952, the left drift was "holed through," an occasion which was duly celebrated by the traditional "holing through" party.

The fact that the tunnel bore intersects the north portal face at a 60-degree angle necessitated the erection of the steel supports in a fan pattern. The supports are secured to the wall plates at one-foot centers on the left and at five-foot centers on the right, an arrangement requiring the use of fillets or "dutchmen" to span the greater distance between the individual arch segments.

The bench section was removed in three operations. The center of the bench for a width of 26 feet was excavated for the entire length of the tunnel while the two remaining side benches were removed in 5- to 10-foot sections in order that the plumb posts could be placed under the wall plates. The posts on the left side were 12 feet long and on the right, 10 feet long—the difference in length being due to the 10 percent superelevation in the tunnel floor. The central section of the bench was removed by drilling vertical holes at four-foot centers, blasting and removing the material as before. Air for the pneumatic equipment was supplied by one Gardner-Denver 500 C.F.M. and two Ingersoll-Rand 500 C.F.M. compressors operating at 100-pound pressure. Electricity was supplied by one Caterpillar and one LeRoi, 25 K.W. generator. Water for the drilling operations was supplied from an artesian well 600 feet deep located at the south portal.

Day and Night Shifts

The typical crew for both heading and bench shifts consisted of one walking boss, one shifter, five miners, five chucktenders, one tool nipper, one mucking machine operator, two dump truck operators, one compressor operator, and one light plant operator.

The day shift was augmented by a tunnel superintendent, one powder man, two timbermen, one bulldozer operator, and a bull gang consisting of a foreman and three laborers.

The tunnel operations were conducted around the clock for six days per week between November 3, 1951, and March 5, 1952, at which date operations were carried on for two eight-hour shifts until March 31st, when the work was put on one eight-hour shift.

The construction of the Gaviota Gorge Tunnel is under contract by the Rhoades-Shofner Construction Company of Los Angeles, of which A. A. Mathews is Chief Engineer and W. A. Ripley is Project Superinrendent. The contract is being administered by the Division of Highways, District V, E. J. L. Peterson, District Engineer, and C. I. Brown, Assistant District Engineer (Operations). The author is the Resident Engineer under the supervision of G. T. McCoy, Jr.* District Construction Engineer.

* Mr. McCoy resigned September 1, 1952, to work for a private contracting firm.

ENGINEER WANTS MAGAZINE

COUNTY OF LOS ANGELES
Road Department

DEAR SIRS: I am presently employed by the Los Angeles County Road Department as a civil engineer assistant in the Location and Design Section of the Construction Division.

I've recently had the pleasure of seeing a copy of your publication, *California Highways and Public Works,* and was very greatly enthused by the wealth of valuable information it contains.

I would appreciate it if you would consider me for your mailing list because I'm sure that I will find your magazine very instructive and applicable to a great deal of my work. It is certainly one of the finest sources of information that I've seen in the field of highway and road design.

Very sincerely,

J. RAMIREZ

Photogrammetry

*Specifications and Practices * For the Use of Aerial Surveys*

By EDWARD T. TELFORD, Traffic Engineer, and
L. L. FUNK, Assistant District Engineer

AERIAL PHOTOGRAPHY applied to mapping is not particularly new but recent years have seen phenomenal development, largely because older methods of mapping have proved too slow and expensive to meet certain present day needs. The highway engineer, faced with demands for surveys and plans expanding at a rate much greater than could be met by expansion of conventional methods and organization, has turned to aerial photogrammetry for help. We have found that aerial mapping methods, modified to suit the needs of the highway engineer and properly combined with conventional ground surveys, will permit us to develop plans more rapidly and at a substantial saving in cost over older methods.

The success of aerial surveys applied to highway engineering depends upon the highway engineer's understanding of the possibilities, as well as the limitations, of photogrammetry. Conventional photogrammetric methods must be properly combined with conventional ground survey methods and the selection of the best combination of methods must include consideration of the problems and requirements of the particular highway engineering job.

California Practices

In California we have developed certain practices which appear to have outstanding value, and it is proposed to devote this paper to those practices to the exclusion of others which may be either better known generally or less important in our experience.

The effect of these developments has been to tie photogrammetric mapping to highway surveys, with the result that on suitable terrain we can now complete preliminary surveys with a large part of the work done from the air. The combination of old and new methods in their proper relation has developed great savings of time and cost in the planning and design.

The most important developments in our practice may be summarized as follows:

(1) Control surveys are made to modified second order accuracy generally tied to California Coordinate System with control net extended for highway use.

This must be carefully planned by the highway engineer and it will generally include control not essential for strictly mapping use.

(2) Permanent points in the control net. These may be either key property corners, existing monuments, or new points selected for later use.

(3) Complete notes of observation and adjustment furnished by the mapping organization to the highway engineer.

Results Obtained

These developments in practice have given us maps from which it has been possible to project a located line with computed ties to points of known position in the control net, complete design, compute quantities, write deed descriptions for right of way, and go to contract with a minimum of additional field survey work. In some cases the located line is not being run in the field until the right of way itself has been purchased and completely cleared. With key property corners and other permanent monuments selected by the highway engineer tied into the primary control net of the survey, and the entire survey tied to the California Coordinate System, the located line as finally run in the field has closed without difficulty.

One of the most obvious advantages to us in the use of these methods is the possibility of completing the survey and design with a minimum of disturbance to the local community.

Contracts Based on Maps

During the past two years the California Division of Highways has awarded contracts for topographic maps from aerial photographs for over 200 miles of highway. The type of highway facility to be located or designed from these maps ranges from two-lane secondary roads to four-lane divided freeways through urban areas. Map scales have been 400, 100, and 50 feet per inch with contour intervals of 10, 5, and 2 feet. On several of the projects it is planned to acquire the rights of way and award the construction contracts on the basis of these maps supplemented by a very minor amount of ground surveys by the division.

Successful use of aerial contour maps, particularly their use in the final stages of design, requires careful planning, adequate specifications, and a reliable mapping contractor. The planning must be done by a highway engineer who is familiar with all phases of location and design, and has sufficient knowledge of photogrammetry and its limitations to specify what is required without incurring excessive costs. Mapping contractors are usually willing to assist in the planning of a project but their knowledge of highway engineering is limited, and in the final analysis it is the highway engineer who must decide what he wants for each specific project.

Suitability of Project

As the first step in planning it is necessary to determine the suitability of the project for this type of mapping and the purpose for which the maps are to be used. For reconnaissance studies and the evaluation of alternate routes satisfactory maps for almost any project can be made by aerial surveys. A high degree of accuracy is not required and, unless the ground is obscured by

* This paper was presented at the meeting of Committee on Design, American Association of State Highway Officials, December 12, 1952.

very tall timber, a specification that the contours be within half the height of the ground cover should result in maps which are adequate for preliminary studies. The specifications for horizontal and vertical control should be broad enough to allow the contractor to take full advantage of his equipment in bridging control across several models.

Where a strip of topography wider than one-half mile is required it will frequently be more economical to obtain a preliminary map at 400 feet per inch with 10-foot contours for the initial studies, to be followed by a larger scale map of a narrow strip along the selected route for use in final location and design. For maps at 400 feet per inch a single strip of photographs will generally cover a width of 2½ to 3 miles.

Several Limitations

Where contour maps from aerial photographs are to be used for final location and design work, there are several limitations which must be known and considered. Most important of these is the extent of the ground cover and its effect on aerial mapping. If the ground is completely obscured the best that can be expected from the stereoplotting equipment is that the contours will be within half the height of the cover. If greater accuracy is required, and it usually is for design work, it must be obtained by supplemental field surveys. The extent to which these field surveys are required will usually determine the suitability of the project for aerial mapping. If the mapping contractor is required to undertake field completion surveys in certain areas where the ground is obscured the extent of this work must be clearly defined in the specifications.

Use of Aerial Contour Maps

A second limitation is the extent to which an existing highway is to be used as a part of the proposed facility. It is obvious that aerial contour mapping is not suitable for a widening project and it follows that its greatest usefulness is on entirely new locations. It will, however, prove satisfactory for some reconstruction projects where a four-lane divided facility is proposed which utilizes the existing highway for two of the lanes, provided the median has sufficient width that tight grade controls are not required.

It is doubtful if the cost of an aerial contour map would be justified across flat terrain where drainage conditions control the grade line to within a few tenths and where earthwork quantities are very light. With this type of terrain in urban areas a large scale planimetric map from aerial photographs has been obtained at a lower cost than a contour map. Another solution is the use of rectified aerial photographic enlargements at 50 feet per inch. These could be tied together for control by a ground survey and used in the field for obtaining spot elevation at road connections, drainage channels, etc. Cultural detail could be traced on the construction plans from the enlargements.

Standards of Accuracy

Having determined that aerial contour maps are practicable for a specific project, the next step is the determination of scale and contour interval and the standards of accuracy to be specified. Our experience in California indicates that for complex highway facilities such as multilane, divided freeways, or expressways where traffic interchanges, ramps, frontage roads, and other features are involved, a scale of 50 feet per inch and a contour interval of 2 feet are the most advantageous. This is particularly true where construction contracts are to be awarded on the basis of the topographic maps without making a final location survey in the field. In such cases the only field survey work prior to award of the construction contract will be for the location of underground utilities, additional property corner ties if required, and elevations to the nearest 0.01 foot where connections are made to improved streets.

In Mountainous Terrain

For the location and design of less complex highway facilities and through undeveloped or mountainous terrain we are generally using a scale of 100 feet per inch and a contour interval of five feet. Here again only a minor amount of field survey work will be required prior to award of the construction contract provided the ground is not obscured to the extent that accurate contours cannot be plotted from the photographs. On projects where aerial contour mapping at 50 feet or 100 feet per inch is obtained we have previously selected the route of the highway facility within rather narrow limits either from small scale aerial photographs, U. S. G. S. quadrangle sheets or other available maps combined with field reconnaissance. Consequently the contour maps are confined to a width sufficient to allow for minor adjustments in location and to permit the layout of traffic interchanges, road connections, etc. This width generally ranges from 600 feet to 2,000 feet as compared to the 200 feet to 500 feet usually obtained from ground surveys.

Requirements

Our most recent specifications conform to the National Standards of Map Accuracy which have been adopted by the major governmental mapping agencies. These standards require that 90 percent of the contours be within one-half the contour interval and that 100 percent be accurate to the full contour interval. For horizontal positions of well defined features they require that 90 percent be within one-fortieth inch and all be within one-twentieth inch of their true position at the final map scale. With detailed topographic maps to these accuracies and covering a strip 600 feet to 2,000 feet in width, the designer has far more information at his disposal than is available from conventional field surveys, and he can develop the final position of the highway and its appurtenances with assurance that no possibilities are being overlooked.

Ground Control Survey

One of the most important factors in the planning and preparation of specifications for a satisfactory aerial mapping project is the ground control survey. Several types of stereoplotting equipment in use today are capable of bridging horizontal control across several photographic models. The mapping contractor will naturally wish to take advantage of this feature to reduce the extent and costs of the ground control surveys. However, a spacing of several miles between monumented control points will not allow the highway engineer to realize the full

potential value of the mapping even though it may comply with the specified standards of accuracy. Additional monuments are required for future staking of the projected center line and right of way lines, for making ties to property and subdivision corners and for obtaining various other information during the course of design work.

Monuments Important

In California we have found it generally advisable to specify such monuments at intervals of 1,000 to 2,000 feet in urban areas and not more than one-half mile in rural sections. The location of these monuments must be carefully planned by the highway engineer to avoid additional and unnecessary survey work in the future. Their location is usually indicated on maps accompanying the contract and specifications. The monuments may be set as arbitrary points for future use or they may be existing property corners or street or subdivision monuments.

Figure 1 shows a section of map as delivered by the contractor in which just this has been done. Not only are the subdivision monuments shown, but property lines may also be confirmed by the fence lines and fragments of fence lines.

On several projects in urban areas we have indicated a sufficient number of property corners to be tied in by the mapping contractor so that deeds may be prepared without additional survey work on our part. In such cases it will not be necessary to run the projected center line in the field until buildings and other obstructions have been cleared from the right of way immediately prior to construction. The value of an adequate number of properly positioned monuments as an adjunct to the aerial survey cannot be too strongly emphasized.

Specifications

Where the aerial contour maps are to be used for design work we specify that the contractor's primary survey network shall be based on and adjusted to first or second order triangulation stations of the U. S. Coast and Geodetic Survey, and that they shall be made by second order triangulation or by modified second order traverse. We further specify that the surveys shall be adjusted by standard methods and that horizontal positions of all monuments shall be based on adjusted data and expressed in rectangular coordinates of the California state-wide system of plane coordinates. Control points, monuments, and coordinate grid lines are shown on the maps with an accuracy to the nearest 0.01 inch.

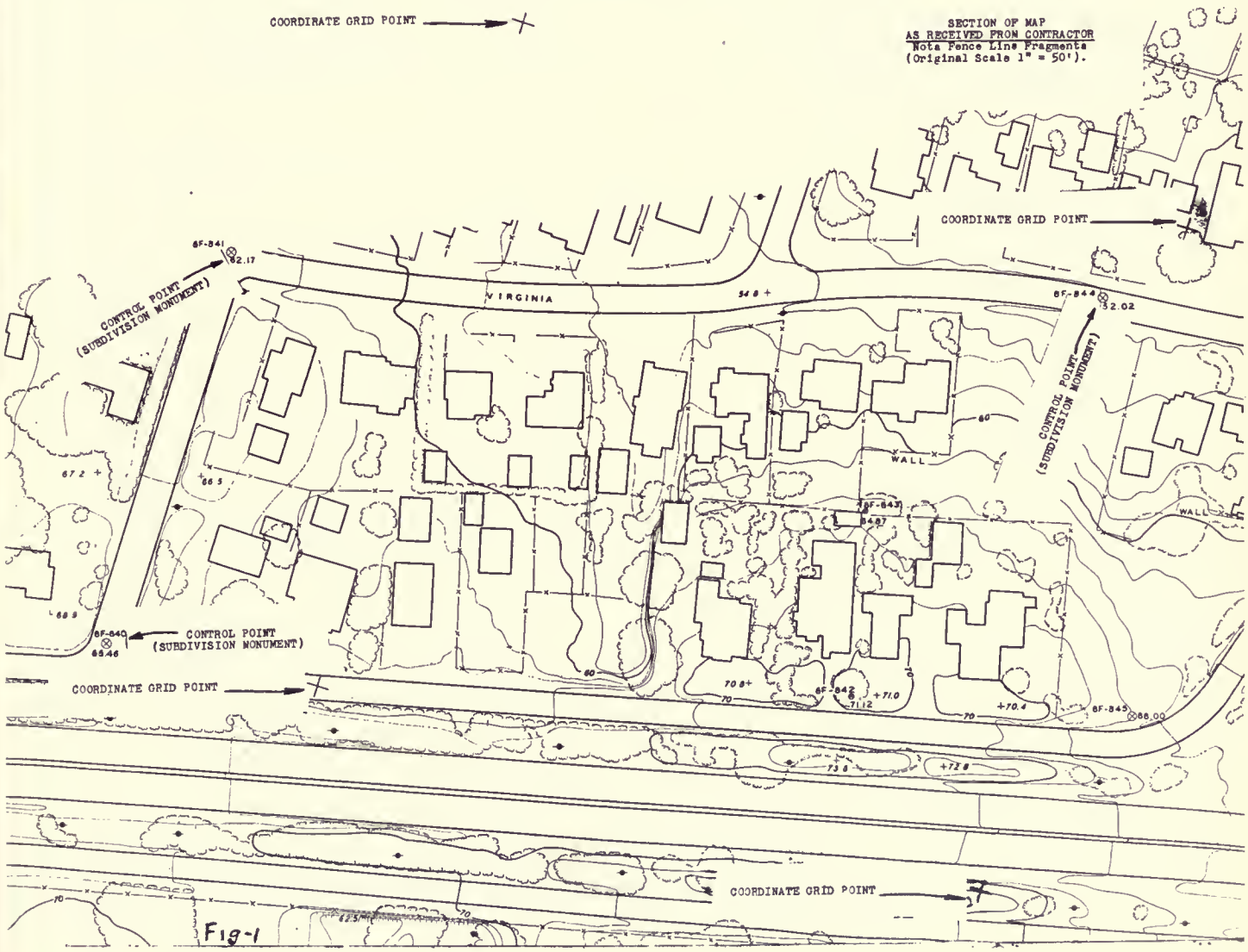


Fig-1

In addition to the horizontal position of all monuments, the contractor is required to furnish the original field notes of his ground control surveys, together with a tabulation showing all measured and adjusted bearings and distances. As a result we have, in addition to the maps, an accurate well-monumented survey network which can be used as the basis for all future survey work on the project.

Figure 2 (which is the same section as that illustrated in Fig. 1) shows the survey coordinate grid, to which the highway centerline is referenced, added to the base map. The ties between monuments on the ground and the "L" line are made in just the same way that ties are made between the "P" and "L" lines in ordinary route surveys.

Vertical Control

The extent of vertical control to be established will vary with the individual project. Quite frequently a level line of the U. S. Coast and Geodetic Survey is parallel or closely adjacent to the project. In such cases a specification requirement that all vertical control points set by the contractor shall have an accuracy of one-tenth the contour interval is considered sufficient.

In view of the wide variety of stereoplotting equipment used by reliable mapping organizations, it is not considered desirable or feasible to require specific equipment or to write a rigid specification as to methods of procedure. In lieu of this we prefer to specify the accuracies required in the final maps and give the contractor wide latitude as to the method of producing them. As a means of evaluating proposals submitted by different mapping firms and to have some measure of control over the contractor, we require that each proposal be accompanied by a statement showing experience in similar work, equipment proposed for the project and scales, operating ratios, and methods of procedure to be used in various phases of the work. This statement also includes the extent of horizontal and vertical control proposed in addition to the monuments we have specified.

Tabulation of Equipment

The following tabulation shows the equipment, scales, and operating ratio proposed by four reliable nationally known mapping organizations for various large-scale mapping projects in California within the past two years.

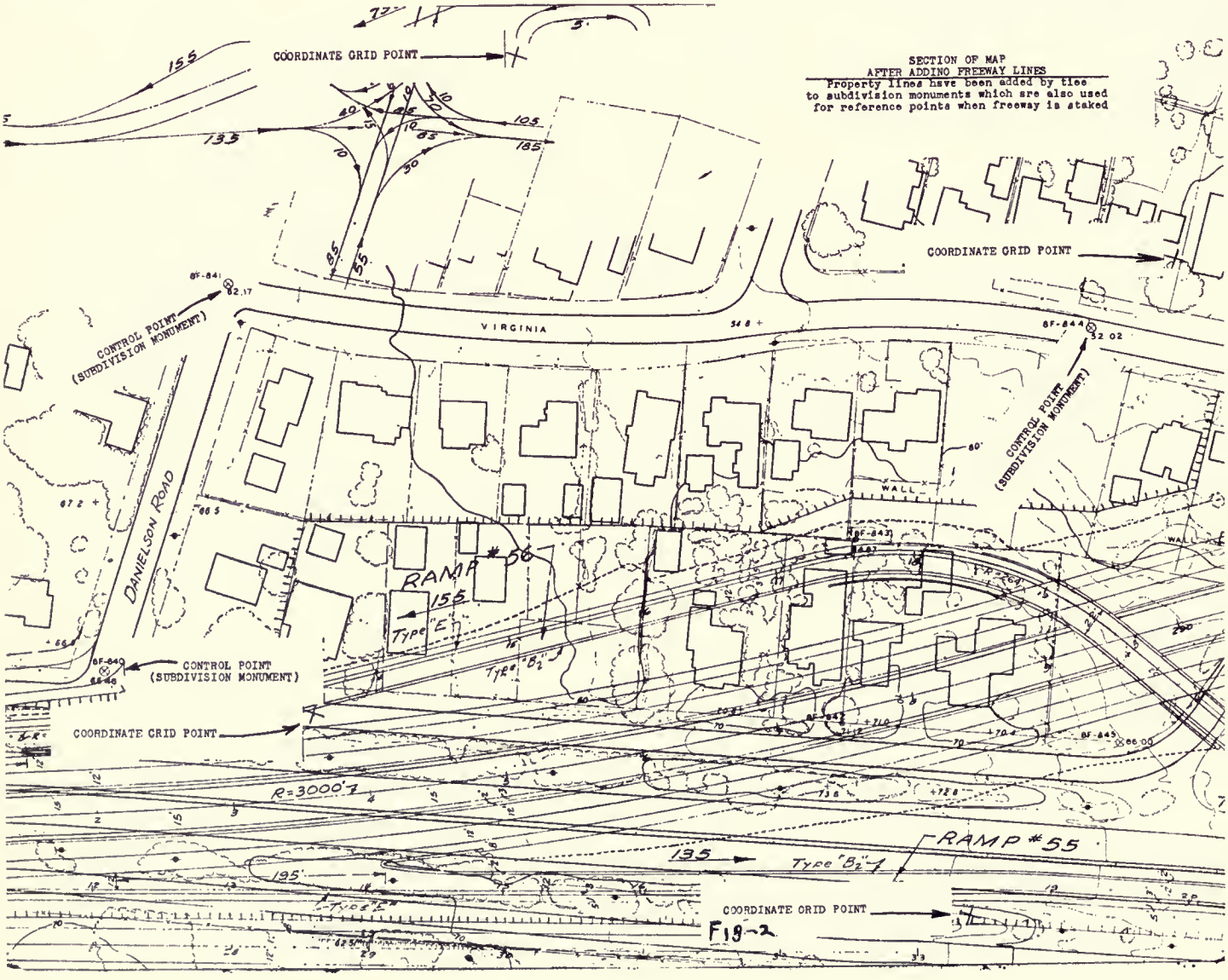


Fig 2

The number and variety of proposals shown for the 100 feet and 50 feet per inch scales are sufficient to be considered a resume of current mapping practice at these scales.

Advantages

The advantages most frequently cited for the use of contour maps made from aerial photographs in highway location and design are savings in time, money, and manpower, and the added width of the band of topography at the disposal of the designer. The latter feature enables the engineer to see possibilities which might otherwise have been overlooked and could very easily result in either savings in construction costs or an improved facility, or both. This is particularly true of superhighways where interchange facilities and frontage roads are involved in the design.

As a measure of cost comparison, the following tabulation has been prepared to show the contract price on a number of recent aerial mapping projects in California.

EQUIPMENT AND SCALES FOR AERIAL CONTOUR MAPPING

Stereoplotting equipment	Flight height	C factor	Flight scale	Map compilation scale
Maps at 1″ = 50′ 2′ contours				
Stereoplanigraph	2,450′	1,200	1″ = 400′	1″ = 50′
Kelsh Plotter	1,500′	750	1″ = 250′	1″ = 50′
Kelsh Plotter and/or Wild A-5	2,000′	1,000	1″ = 333′	1″ = 67′
Kelsh Plotter	2,000′	1,000	1″ = 333′	1″ = 70′
Maps at 1″ = 100′ 2′ contours				
Kelsh Plotter and/or Wild A-5	2,000′	1,000	1″ = 333′	1″ = 67′
Kelsh Plotter	2,000′	1,000	1″ = 333′	1″ = 70′
Stereoplanigraph	2,450′	1,200	1″ = 400′	1″ = 50′
Maps at 1″ = 100′ 5′ contours				
Kelsh Plotter and/or Wild A-5	5,000′	1,000	1″ = 833′	1″ = 167′
Kelsh Plotter	3,000′	600	1″ = 500′	1″ = 100′
Stereoplanigraph	4,900′	1,000	1″ = 800′	1″ = 100′
Kelsh Plotter	5,000′	1,000	1″ = 833′	1″ = 167′
Maps at 1″ = 400′ 10′ contours				
Kelsh Plotter and/or Wild A-5	10,000′	1,000	1″ = 1667′	1″ = 333′
Kelsh Plotter	10,000′	1,000	1″ = 1667′	1″ = 350′
Stereoplanigraph	9,800′	1,000	1″ = 1600′	1″ = 200′

REPRESENTATIVE COSTS OF AERIAL SURVEYS

Map scale	Contour interval	Terrain	General width of mapping	Miles	Average cost per mile
1″ = 50′	2′	Semi-urban—rolling	600′-1500′	15	$1,630
1″ = 50′	2′	Rural—rolling	700′-1300′	11	1,410
1″ = 100′	2′	Rural—rolling	700′-1500′	12	1,210
1″ = 100′	5′	Rural—rolling	500′-1600′	9	935
1″ = 100′	5′	Rural-rolling to mountainous	1000′-2000′	60	930
1″ = 400′	10′	Rural—rolling	5000′-9000′	15	485

Representative Costs

The costs shown in the tabulation can be considered representative of contracts totaling 20 miles or more in length. Frequently costs can be reduced by combining several short highway projects in one mapping contract. The saving in time is dependent on the work load of the various mapping contractors and the urgency of the project. A premium price is usually paid for a rush job and results are not always satisfactory. As a general rule, if a project is over five miles in length, and if only one survey party is available, a saving in time can be made by using aerial surveys. The time saving will increase rapidly with the size of the project.

As previously discussed, the shortage of engineering manpower will probably outweigh the other advantages afforded by aerial survey methods for several years to come. Any highway organization confronted with this problem should give serious consideration to a wider use of aerial photographs and aerial survey methods.

PEDESTRIAN SAFETY

When a pedestrian steps from the curb at a crosswalk, he has started to cross the street and the right of way is his. By giving the pedestrian the breaks as well as the brakes motorists can easily cut accidental injuries and fatalities.

In Memoriam

HARVEY P. OATES

Harvey P. Oates, 57, foreman in the Division of Highways Maintenance Department, died on December 7th while working with his crew on Freeport Boulevard (State Sign Route 24) near the airport south of Sacramento. Oates' death was believed due to a heart ailment.

Oates was a native Sacramentan with over 30 years' service as an employee of the Division of Highways. He started work with the division on June 6, 1922, and became a maintenance foreman on October 14, 1932, a post he held until his death.

All of Oates' service was in District III. Previous to being assigned to the Sacramento area, Oates was foreman of the Yuba Gap section on U. S. 40 and also of the Echo Summit section on U. S. 50.

Oates is survived by his wife, Mary, his son, Thomas, his mother, Julia, and six brothers and sisters.

Early Days

Minutes of First Highway Commission In 1914-15 Make Interesting Reading

By R. C. (CASS) KENNEDY, Secretary, California Highway Commission

(Continued from last issue)

THE FIRST entry in the minutes of January 19, 1914, is that the California Highway Commission convened at 2 p.m., and present were Commissioners Charles D. Blaney, N. D. Darlington, and C. F. Stern.

The secretary reported that at the meeting of the Advisory Board held in San Francisco on December 31st, Governor Johnson stated that for some weeks past he had held the resignation of Burton A. Towne, Chairman of the Commission, which he very reluctantly had consented to accept, and the Governor announced that he had appointed Charles Frank Stern, of Eureka, to the position of commissioner vacated by Towne.

Inventory of Equipment

You will remember that in the latter part of 1913 the Board of Control had asked the commission for an inventory of all the equipment under its control, and had authorized the Highway Engineer to furnish the Board of Control such inventory. This inventory was accepted by the commission, ratified and approved, and accepted as the inventory of the commission. The amount of the inventory was $50,000.96. Incidentally, Blaney was acting chairman at this meeting.

At the meeting on the twenty-first of January, a long resolution was read into the minutes regarding the resignation of Towne and the appointment by the Governor of Stern. The Advisory Board proceeded to appoint Stern on the commission to take the place of Towne.

Practically all of the afternoon of the 21st was taken up in reading into the record the resolutions passed by the Advisory Board. There are 15 pages of resolutions the Advisory Board had passed approving acts of the commission. The last notation in the minutes for January 22, 1914, showed that on a motion duly made by Commissioner Darlington, and seconded by Commissioner Stern, Commissioner Blaney was declared elected chairman.

Mission Bell Guideposts

The El Camino Real Association of California appeared before the commission and asked that it be allowed to erect Mission Bell guideposts on the state highway approximately one mile apart. This was to begin at Station 0 on U. S. 101, at a point 14 miles from Los Angeles Plaza and ending at the Ventura County line. The precise locations of the guideposts were to be fixed by the Division Engineer.

These guideposts have been seen by many motorists who have traveled the Coast Route between Los Angeles and San Francisco. They were a pole with a yoke on it, holding a bell, with the letters "El Camino Real" cast into the sides of the bell. The bell was flat—it was not a bell that could be rung or anything like that. This is probably the first case where mementos such as this were allowed on the state highways.

Yolo Causewoy

On February 12th, the commission passed a resolution regarding the Yolo Basin Causeway, which proposed approximately 14,000 feet of concrete bridgework and about 2,000 feet of timber trestle. It was stated that the causeway was an integral, essential link in the State Highway System and the construction of it was deemed imperative in order to care for transcontinental as well as local traffic by the shortest possible distance from Sacramento to San Francisco.

The commission went on to say that although this construction lay wholly within Yolo County, and the mandate of the State Highways Act placed the interest burden of cost of this construction of approximately $450,000 on Yolo County, it would resolve that it was the sense of the California Highway Commission that Yolo County should be relieved by special legislation from this burden.

The commission also stated that this burden properly belonged to the State at large and the commission pledged itself to institute and recommend appropriate legislation to such end.

New Money Voted

On February 26th, the commission was evidently running short of money as it passed a resolution, and the advisory board also passed it, that the State sell $3,000,000 of state highway bonds so that work could continue. Also read into the records was a resolution passed by the advisory board that the Motor Vehicle Act provided that the moneys accruing to the State by virtue of such act shall be expended under the sole direction of the Department of Engineering for the state highway maintenance. It was, therefore, resolved that the California Highway Commission was to take full control and disposition of five-sixths of the money accruing to the State for the maintenance of the state highways from the revenues of the Motor Vehicle Act, and that it was to take full charge of the maintenance of the state highways contemplated to be maintained by the State Highways Act, and perfect such organizations as might be deemed necessary.

So, here was the formation of our Maintenance Department of the Division of Highways. Also, on this date, the commission decided that joint meetings of the seven Division Engineers, with the Highway Engineer and the commissioners, at intervals of not more than 120 days, would be highly desirable. It was recommended that such meetings be inaugurated as a permanent feature of the highway work, and that the first meeting was to be held on March 26, 1914.



The builders of California's State Highways in 1914: Left to right, R. H. Stolnaker, C. C. Carlton, S. V. Cortelyou, W. Lewis Clark, T. E. Stanton, R. K. West, W. C. McClure, State Engineer; Austin B. Fletcher, F. G. Somner, Charles F Stern, J. B. Woodson, F. W. Haselwood, E. B. Osburn, N. D. Darlington, S. S. Stahl, Charles D. Blaney, W. S. Caruthers, George B. Harrison, A. B. Clevelond, W. R. Ellis, R. E. Dodge, A. E. Loder, J. H. Small, W. C. Howe. Sitting, left to right, George R. Winslow, H. L. Warren, T. A. Bedford, George Mattis.

Meeting of Engineers

March 26th was the day that had been set aside to hold the meetings with all the Division Engineers at headquarters, along with the Highway Engineer and the commission. The entire program of the meeting, which started at 9 o'clock in the morning, continued all day and was followed by a dinner at the Sutter Club that night.

On May 25th a notation is in the minutes that Secretary Ellis was granted a leave of absence for five months without salary. There was also a vote taken that the Publicity Department be instructed to arrange for an issue of the *Highway Bulletin* as soon as practicable, and be authorized to incur the necessary expenses for cuts. It was also voted that George B. Harrison be given the official title of Editor of the *Highway Bulletin.*

The next day the commission met and the first order of business was to appoint Charles C. Carleton, the attorney for the commission, to serve as Acting Secretary of the commission during the absence of Ellis.

On May 27, 1914, it was voted that the commission hold semimonthly meetings in Sacramento on the Mondays prior to the advisory board meetings. So that established a definite time for the Highway Commission to meet.

Helen Hawkins Appointed

Along in June, 1914, the commission seemed to be getting automobile conscious, for it voted that an automobile be procured for the Second Assistant Engineer so that he could travel over his territory more easily. Also, in June, a harvester down in Fresno County had damaged our highway, and the commission passed a long resolution to "The Honorable District Attorney of Fresno County" calling attention to the importance of this case, and requesting him to most vigorously press the charges against the defendant and to "call upon the commission, or its employees, for such appropriate evidence as he may require to fully present the cause of the people of the State of California." It would seem that some farming machinery had damaged the highways and the commission decided that it was going to be repaid for it.

In July, the commission appointed Helen Hawkins for a temporary term as Special Assistant Secretary and Special Assistant Disbursing Officer. Miss Hawkins was appointed as a stenographer on June 22, 1912, at headquarters office, salary $50 a month. She received various raises, voted by the commission, and on September 1, 1918, she was getting $115. At the time she left, she had the title of Assistant Secretary and Assistant Disbursing Officer, having been appointed to

that position January 1, 1919. She went back with the Division of Highways briefly in 1925, and for a number of years had been secretary to the State Printer.

More Room Needed

During the August meeting, the commission apparently was expanding as it passed a vote that it would rent four more rooms in the Forum Building, Sacramento. Also, at the August meeting, notes say that the Highway Engineer reported 17 appointments from certified lists of eligibles that had been registered with the State Civil Service Commission. This is the first notification, or rather the first notice, in the minutes of the commission that the State Civil Service was furnishing lists of eligible people for employment by the Highway Department.

Placer County Request

In October, 1914, the commission voted that the Placer County Chamber of Commerce be permitted to place Lincoln Highway signs, not to exceed six in number, along the line of the state highway between the Sylvan School and Roseville. These signs were to be painted on the fences along that portion of state highway. The State still is sticking to the idea of not erecting any signs except directional signs on the rights of way of state highways.

In November, troubles had begun to hit the commission. The Graff Construction Company had the contract for building the Yolo Causeway, and on November 10th, it was brought to the attention of the commission that a strike had been called by the Federated Trades Council against this construction company. The commission immediately offered itself as a volunteer friendly mediator representing the State. Its interest was only to see that the construction work on the Yolo Basin Causeway should proceed without unnecessary difficulty or delay.

Also, on November 10th, reference is made to the matter presented by Right of Way Chief Harrison, in his letter dated October 26th, as to the recommendations of the Automobile Club of Southern California that the commission take action to prohibit the placing of advertising signs and billboards along the state highways. Attorney Carleton was requested to draw up a bill for submission to the coming Legislature prohibiting such signs on all state highways.

Lincoln Highway Signs

At the December 7th meeting, there was a request from a Mr. Cuyler Lee, who was a representative of the Packard Motor Car Company of Oakland, to place mile posts along the boulevard in Alameda County bearing the Lincoln Highway sign. With this communication were sketches of the proposed mile posts bearing "One Mile From Packard Garage, Oakland, etc.," but the commissioners voted against this and refused to establish any precedent of a character that would be implied by granting the above request. In other words, they didn't want advertising of any kind on the state highway rights of way. That still is in effect.

At the December 22, 1914, meeting, the commission boosted the salary of Mr. Carleton, the attorney, from $250 to $300 per month. This was to be effective on December 16, 1914, until further order of the commission.

The foregoing were the most important things that happened during the year 1914, as I see them. There may have been other things that transpired that were not written up in the minutes, but from the minutes you can see that by now the commission was "getting into the groove," as it were. Its meetings were becoming regular—twice a month—and it was transacting much routine business.

In looking over the minutes of 1915, I find that the majority of them pertain to routine matters alone. It seemed that every permit that was granted to erect a telephone pole or a light pole or a sewer under the highway, or a water pipe, or anything else, had to be voted and the commission had to sign them.

I may have mentioned this before, but it seems that every time the commission decided on a route, or if it let a contract, or did anything else, its actions had to be ratified by the entire Advisory Board of the Engineering Department of the State of California, and this entailed taking up a lot of space in the minutes with the resolutions passed by the advisory board after the commission had decided on something.

Need for More Money

In January, 1915, the commission suggested to the advisory board and the Board of Control that it should have a million dollars more of bonds sold so that it could continue its work. There was also a notation that Mr. Harrison, who was acting as Chief of the Right of Way Department, and also as Editor of the *Highway Bulletin*, be relieved of his duties in the Right of Way Department and be stationed in Sacramento under the immediate direction of the Highway Engineer.

In February of 1915, the Highway Engineer was authorized to proceed with the construction of a booth for the commission's exhibit at the San Francisco Panama-Pacific Exposition. The plan had been prepared by the State Architect, and the Highway Engineer was authorized to spend not more than $775 for the erection of a booth and an exhibit therein.

In setting up the commission, the Legislature evidently provided for the use of a revolving fund, and voted certain moneys to be kept in it. It laid down a certain number of rules, amongst others that all sums as were paid out of the State Treasury to the Highway Commission for use as a revolving fund should be deposited in a bank in Sarramento. It authorized all officers and employees of the commission then authorized to sign checks, to sign checks on the revolving fund. The Highway Engineer was empowered in his discretion to pay to the division offices such sum or sums as he deemed to be required from time to time for the payment of wages of day laborers. Any funds like that were to be known as the "Division Revolving Fund."

The Division Engineers were authorized, with the approval of the Highway Engineer, to designate two officers, or employees, in each division office; one to be known as the cashier and the other, as the assistant cashier. No check would be considered valid unless it was signed by either the cashier or the assistant cashier.

Permits for Dredgers

In August of 1915, traffic on the road between Sacramento and Folsom had a new vehicle to contend with. Permit No. 81 was issued to the Natomas Company of California, with headquarters in Sacramento. This permit granted the Natomas Company permission to excavate across the state highway for a width of 300 feet for the purpose of allowing a dredger to pass over from one portion of its property to another. Of course, it was understood that the Natomas Company would maintain a good and sufficient roadway for all purposes during the time the highway was torn up and that after the dredger passed over, the highway was to be replaced in as good condition as before.

In September, the commission decided that there was no reason to initial every permit that was issued. These permits were becoming more regular and the waiting until the Highway Commission met to have them initialed by the commission was holding up some of the work. So, on September 17, 1915, the commission voted that the initialing of permits be dispensed with. It gave the power to the secretary, with the approval of the Highway Engineer or the First Assistant Highway Engineer, to issue any and all permits. This took a great deal of work off the individual commissioners and put a bit more work on the secretary.

In December of 1915, Permit No. 153 was issued to the Wilkes-Barre Dredging Company. This firm was given permission to excavate a channel across the state highway between Station 58+0 and Station 60+0 on the road between Sacramento and Folsom. This was for the purpose of moving another dredger across the highway. Two dredgers in one year!

There is nothing much of extra curricular duties that the commission seems to have done during 1915, except to keep up the good work that it had started in 1911.

All during this year, new routes were being adopted and new contracts were being let; new contracts finished, and authorization for more reconnaissance surveys issued. Delegations from all over the State appeared at different times, promoting their particular roads, and more and more counties were making arrangements to purchase highway bonds so that the work could go forward in their counties.

(To be continued)

In Memoriam

ARCHIBALD C. IRISH

Archibald C. Irish, Highway Superintendent at Nevada City, in District III, passed away at the Community Hospital in Grass Valley on December 9, 1952.

Arch, as he was known by all of his friends and acquaintances, was born in Cloverdale, California, on April 17, 1895.

He and his family moved onto a ranch in the vicinity of Placerville in the early 1900s where he attended the local schools.

Arch first went to work for the Division of Highways on May 10, 1917, as a rodman. He was a mechanic in the Air Force in World War I from July, 1917, to about July, 1919. He returned to work for the Division of Highways in September, 1919, as a rodman and continued in that classification until January, 1920. He was employed by the Western States Gas and Electric Company as an instrumentman for the next several months and again returned to work for the Division of Highways in March, 1921. He had been continuously employed by the division since that time and had been a highway superintendent since January, 1944.

Practically all of his service has been in District III where he had wide and varied experience on preliminary and location surveys, construction and maintenance.

Arch trained many young employees during his career and will be sorely missed by them as well as by numerous other friends and acquaintances.

He is survived by his wife, Ruth, a son, William, and a brother, Russell.

In Memoriam

WILBURN H. IRISH

Funeral services for Wilburn H. Irish, 56, Supervising Highway Engineer for the State Division of Highways, were conducted December 17th at 3 p.m. in the Church of the Recessional at Forest Lawn, Glendale.

A native son, born in Placerville and receiving his early training in that vicinity, Mr. Irish started his civil engineering career with the State Division of Highways on March 31, 1916, in District III with headquarters at Sacramento. He worked up through the various field positions from Rodman to District Location Engineer. In this latter position Mr. Irish had charge of survey parties on highway and freeway location in the Los Angeles District from 1933 to 1947. In 1947 he was promoted to the position of Supervising Highway Engineer, working out of Sacramento Headquarters Office and visiting all parts of the State in supervising highway location projects.

Mr. Irish died suddenly of a heart attack on December 12, 1952, at the home of his brother, Arch Irish, in Grass Valley where he had come to attend his brother's funeral. The brother, Arch, had died four days before, also of a sudden heart attack.

Mr. Irish is survived by his wife, Amelia F. Irish, and his 19-year-old son, Wilburn H. Irish, who is an engineering student at the California Institute of Technology. Mr. Irish maintained the family home at 419 Arcade Place in Glendale for many years, where his wife and son are now residing. He was very interested in youth activities and for many years served in the Glendale Bay Scout's Council.

TOO MUCH ECONOMY

Although it is not a sin of which many motorists are guilty, there is such a thing as overdoing the economy of a lean carburetor mixture. Beyond a certain point it is bound to result in a loss of power. Moreover, the chances of backfiring are increased with the greater likelihood of causing a fire if the engine is covered with an oily waste in the vicinity of the carburetor.

Retirements *from* Service

GORDON ZANDER

On January 1, 1953, Gordon Zander, Assistant State Engineer in charge of water rights administration, groundwater investigations and quality of water studies for the Division of Water Resources, retired after 39 years of service. His service had been under eight governors, from Hiram W. Johnson to Earl Warren.



GORDON ZANDER

Mr. Zander was born in San Rafael, California, on December 10, 1890, and grew up in Oakland, where he attended the public schools. He graduated with a civil engineering degree from the University of California with the class of 1913. During World War I, he served with the U. S. Corps of Engineers in France as a second lieutenant.

He began his public service with the State Highway Commission on April 1, 1914, as an assistant civil engineer. In July, 1916, he transferred to the State Water Commission, which was the forerunner of the present Division of Water Resources in the

. . . Continued on page 49

ALBERT F. WRIGHT

Albert F. Wright, stationary fireman at the Yuba Gap Maintenance Station in District III, retired from state service on January 1st last, after 18½ years of service.

Pop, as he is known to all, was born in Mattoon, Illinois, June 19, 1887, and moved to Sacramento in 1907, where he was employed by the Buffalo Brewing Company and the Capital Ice Company until the fall of 1933.



ALBERT F. WRIGHT

On December 13, 1933, he was employed as a stationary fireman in Truckee; and, except for temporary assignments at other stations in District III, he worked continuously in the Truckee-Yuba Gap area as stationary fireman.

For almost 15 years Wright had at Yuba Gap Maintenance Station an infallible winter weather prophet in the form of a nondescript tomcat, appropriately named Tom. Scientifically constructed barometers had nothing on Tom when it came to predicting a heavy snowfall.

"Many, many times," Wright says, "it would start snowing but Tom would take off for Emigrant Gap, Fulda or Lake Spaulding and we always knew that we did not have to get our snowplow equipment ready for a battle with the elements. If it started to snow and Tom holed up in the cookhouse, we knew we were in for a bad snowstorm. He never failed us. He must have made thousands of trips up and down the highway without being hit by a passing auto. A housewife at Emigrant Gap tired of Tom's nocturnal caterwauling, blasted

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MABEL PERRYMAN ROWLAND

MRS. MABEL PERRYMAN ROWLAND, of the Division of Water Resources, State Department of Public Works, retired from state service on January 1, 1953. She came to the employ of the State of California in May, 1926.

Prior to that time she was employed locally for a number of years—first in



MABEL PERRYMAN ROWLAND

the business office of The Sacramento *Union*, and later as secretary to the district sales manager of the Standard Oil Company.

For two years, 1926 to 1928, Mrs. Rowland was a hearing reporter for the State Real Estate Department, working in Sacramento and San Francisco. In March, 1928, she transferred to the Division of Engineering and Irrigation, now the Division of Water Resources, as supervising clerk and secretary to State Engineer Edward Hyatt, retired, remaining in that position to the present time under State Engineer A. D. Edmonston.

. . . Continued on page 49

GORDON ZANDER

Continued from page 48 . . .

matter of the administration of water rights in the State.

Progressive Water Laws

He has successively served as associate, senior, supervising and principal hydraulic engineer, and for the past year has held the position of Assistant State Engineer. During his engineering career Zander has seen the water law and the water rights administrative procedure in California develop from the time when there was practically no control over the use of water, to the present time when over 9,000 appropriative water rights are under state permits, and there are some 40 stream systems and groundwater basins on which the water rights have been adjudicated or are in the process of adjudication through the Division of Water Resources. At present there are also 15 "watermaster service areas" in which diversions of water are being administered by the State Engineer through the agency of watermasters.

One of the most important jobs under Zander's supervision in recent years has been the division's investigation and report as referee for the superior court in the case of *California Water Service Company* v. *City of Compton, et al.* These proceedings involve over 300 rights to pump water from the West Coast Basin in Los Angeles County, a heavily industrialized area in which the total assessed property values are around a quarter of a billion dollars. This is the first adjudication that the division has undertaken where sea water intrusion into the basin was an important factor.

Helped Form CSEA

Mr. Zander took an active part in the formation of the California State Employees' Association in 1931, and served on its board of directors from 1932 to 1935. He was chairman of the association's civil service committee in 1932 and 1933 and chairman of its legislative committee in 1935. He has always been a strong advocate of the "merit system" in state employment, which was something new in the early "thirties," but is now a firmly established policy in California.

He was active in Masonic work in his earlier years, and is at present a member of Ben Ali Temple of the Shrine, of the Sutter Club in Sacramento, and of the California Club in Los Angeles.

In retirement, Zander plans to devote a portion of his time to his farming interests in Sutter County. He and Mrs. Zander plan to do some traveling, including a trip to Palm Springs soon after the first of the year, and a trip to Europe a little later on. He also expects to do a limited amount of consulting work in the field of water right problems and water litigation. He plans to maintain his residence in Sacramento permanently.

ALBERT F. WRIGHT

Continued from page 48 . . .

him with a shotgun one night, and we lost an excellent pal and perfect weather prophet."

During his years on the hill, Pop made numerous friends as was demonstrated at a farewell party held at the Rancho Sierra Inn near Yuba Gap in his honor when 80 fellow employees and friends gathered to present him with a radio and to extend their best wishes on his retirement.

Wright will make his home in Sacramento with his daughter and hopes that his many friends will visit him.

MABEL PERRYMAN ROWLAND

Continued from page 48 . . .

On Friday, December 19th, members of the staff of the Division of Water Resources entertained Mrs. Rowland and her husband at a luncheon in the Hotel Sacramento. Director of Public Works Frank B. Durkee presented her with the 25-year California State Service Pin and Certificate; State Engineer A. D. Edmonston and Mrs. Isabel Nessler presented gifts to her on behalf of the staff members and friends.

Mrs. Rowland and her husband will continue to make their home in Sacramento.

C. M. Gilliss Accepts Post With Director

C. M. (Max) Gilliss, who resigned from the office of the County Surveyor and Road Commissioner in Riverside County has assumed the duties of Special Representative of the Department of Public Works under appointment by Director Frank B. Durkee.



C. M. GILLISS

Gilliss was born and reared in Oklahoma. He took his college training at Riverside College, University of California at Los Angeles, and Oklahoma A. & M. at Stillwater, Oklahoma. In 1942 and 1945 he attended engineering and sales schools with International Business Machines Corporation, Endicott, New York. He is a licensed public accountant in California.

Gilliss went to work in 1937 at Riverside for the California Electric Power Corporation as operator and chief operator of its IBM accounting systems. In November, 1946, he first entered public service as a systems expert for Riverside County and chief of its central IBM accounting section. This work brought him in intimate contact with the functions and purpose of many local governmental units including the offices of county assessor, sheriff, auditor and clerk and the de-

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Crow Canyon Road

Reconstructed by Alameda County

By FRED E. THOMPSON, Resident Engineer

IMPORTANCE of the route now known as Crow Canyon Road in Alameda County has been recognized since January of 1856, when the board of supervisors appointed Messrs. Hayward, MacDonald and Miller as road viewers in answer to a petition. The signators to this petition stand high on the roster of Alameda County pioneers, and it was their request that a road be laid out and opened between an existing road in Contra Costa County and the Stockton Road, now U. S. 50, through Castro Valley, near Hayward. The route was declared a public highway by the board of supervisors in August of 1861.

Then, as now, this road provided one of the few east-west routes traversing the barrier ridge lying between Alameda and Contra Costa Counties, and carried much of the coach and commercial vehicle travel between the southern portion of the two counties. It originally was a narrow earth and gravel road, with the multicurve and steep gradients characteristics usually found in such roads designed or developed for wagon travel through rough terrain. Reconstruction and improvement to the alignment and section existing prior to the current improvement produced an oiled surface of from 15 to 18 feet in width and shoulders varying from zero to five feet in width, and was accomplished during the period 1926 to 1933 inclusive. The funds for that work were provided from county, CWA, and WPA sources.

Heavy Traffic

During the past several years, particularly during World War II and subsequent years, traffic over this road has greatly increased both in total volume and in percentage of heavy commercial vehicles; with particular respect to tank trucks operating between the petroleum refineries, in the Martinez area, and the State Highway System in the vicinity of Hayward. As a result, the old oiled surface was rough and broken throughout the length of the project, and costly and constant maintenance was necessary to permit reasonably safe travel.

The section for the current improvement was designed on the basis of a traffic index of 6.36 and a resistance ("R") value of 18 for the basement soils. On this basis, the following section was adopted: three inches of plant-mixed surfacing, six inches of crusher-run base, and nine inches of imported subbase material. The pavement width is 24 feet from U. S. 50 to mile 3.6, and 22 feet for the remaining 3.1 miles; with shoulder widths varying between three and seven feet, the average width being six and one-half feet.

Alignment and Grade

Several factors influenced the design of alignment and grade. Chief among those factors is the consideration of Crow Canyon for a future reservoir site, as part of the water resources plan of the State Division of Water Resources. For this reason radical relocation was deemed inadvisable and an alignment was selected that followed the existing alignment, except for minor changes at the approaches to bridges and in the vicinity of the Norris Canyon intersection. Curvature was held to an average radius of 600 feet; and grade was held as nearly as possible to eighteen inches above the existing surface, to keep roadway excavation at a minimum and to take advantage of the bearing capacity of the existing road. With the exception of one short length having a 7.44 percent grade, gradient is less than 5 percent. Humps and sags in the old road were levelled to allow satisfactory sight distances and provide good riding qualities.

A number of recurrent slide areas exist on this road. Due to prohibitive cost required to completely correct the conditions, slide control effort was limited to flattening the cut slopes where sufficient right of way existed. It is estimated that the maintenance cost in removing slides will be more economical than major slide prevention work at the time of construction.

Design and construction engineering for the project was provided at county expense and by personnel operating under the direction of Wallace B. Boggs, County Surveyor and Road Commissioner of Alameda County. The contract for the project was let by the Department of Public Works, Division of Highways, to Frederickson & Watson Construction Company of

CALIFORNIA HAS 1,000 MILES OF MULTILANE DIVIDED ROADS

California now has 1,000 miles of multilane divided road on the State Highway System—well, almost.

State Director of Public Works Frank B. Durkee reports that at the beginning of 1953 the exact mileage of completed State highway of four or more lanes divided was—999.9.

The entire State Highway System comprises 13,715 miles of constructed road. A recent engineering report indicates that improvement is needed on 12,067 miles, of which at least 3,374 should be made four or more lanes.

The growth of the multilane divided highway network in California is shown by the following figures: on July 1, 1945, 329 miles; on July 1, 1947, 481.3 miles; and one year ago, 947 miles.

Another 144.8 miles of multilane divided highway are now under construction.

Most of the multilane divided mileage is of the expressway type, with some intersections, entrances and crossovers at grade. Only about 100 miles of full freeway—with access only by means of designated ramps and with all intersecting streets carried over or under the highway—have been completed or are under construction.



Two views of Crow Canyan Road in Alamedo County after reconstruction with county and Federol Aid Secondory funds

Oakland on July 9, 1952. Work was begun on July 14th and continued until completion on November 14th, under Mr. Carl Poss as representative for the contractor and general supervision by engineering personnel from District IV, Division of Highways. Fred E. Thompson was Resident Engineer for Alameda County on the project.

The cost of this work amounted to approximately $427,000, of which approximately $124,000 was allocated from Federal Aid Secondary Funds and the balance advanced by Alameda County.

AN UNUSUAL BOX CULVERT INSTALLATION

By M. L. CARDWELL, Highway Superintendent

A DRAINAGE problem at the intersection of Stowell Road with U. S. 101 at the southerly limits of the City of Santa Maria, caused in the main by development of new subdivisions whereby the erection of new homes and the paving of numerous streets funneled storm waters into drainage ditches already taxed by waters diverted from natural drainages by land leveling in connection with farming operations, was recently remedied to a major degree by the installation of a 3 foot by 1 foot by 88 foot reinforced concrete box culvert which was installed adjacent to a similar structure in place under U. S. 101 at that location.

U. S. 101 north of this intersection becomes a city street section 48 feet wide between curbs. At the north side of the intersection this width is reduced to a net 42 feet by the existence of gutter inlet structures on each side. Due to this restricted width it would be extremely difficult to build a new structure in place and satisfactorily handle the traffic load of approximately 14,000 daily vehicles of which 10 percent are heavy trucks. Normal operations would result in considerable congestion and traffic would have had to be detoured for a period of at least three weeks.

Structure Precast

In order to avoid this lengthy disruption of traffic it was decided to precast the structure in four units, each 22 feet in length, and make the entire installation in one day's time. The structure was accordingly designed and fabricated for field assembly at the Santa Maria Maintenance Yard.

Lifting eyes (*Photos 1, 2, and 4*) were made from 1 inch round mild steel with welded eyes at one end and 1 inch malleable iron washers welded to the other end for an anchor. These rods extended through the sidewalls and into the floor of the structure 3½ inches. They were placed at a slight angle to provide a straight pull from the lifting cables (*Photo 1*).

To secure the joints nine pieces of ⅜-inch by 2-inch by 2-inch angle iron 10 inches in length were placed at joint ends of each section, four pieces in the sidewall and five pieces in the top. One leg of the angle secured with dowels made of ½ inch reinforcing steel was placed in the wall and the other leg placed flush with the outside of the wall (*Photo 3*).

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RIBBON CUTTING CEREMONY MARKS OPENING OF ORANGE GROVE AVENUE BRIDGE IN PASADENA

On December 22, 1952, at 10 a.m. the Queen of the Tournament of Roses, Leah Feland, cut the ribbon that stretched across the roadway of the newly completed Orange Grove Avenue Bridge in Pasadena. This was a very important occasion because the completion of this bridge structure across the Colorado Freeway took out of use a curving detour around construction and made the traffic handling problem much easier for the Pasadena Tournament of Roses and the football game in the Rose Bowl on January 1, 1953.

The new Orange Grove Avenue Bridge provides a roadway 64 feet wide between curbs with two 12-foot wide sidewalks, to carry the traffic on this important north-and-south Pasadena arterial over the Colorado Freeway. The total length of the bridge is 110 feet. It is of reinforced concrete box girder type, with provision within the deck for gas pipes, water pipes, telephone cables, and electric power cables.

Splendid Cooperation

This bridge is just east of the $5,000,000 Colorado Freeway Arroyo Seco Bridge, both of which State Division of Highways contracts are with the Guy F. Atkinson Company. This company has completed the Orange Grove Avenue Bridge in record time, with the splendid cooperation received from the various Pasadena city departments and from the Southern California Gas Company and Pacific Telephone and Telegraph Company. The total contract allotment for the Orange Grove Avenue Bridge is $257,800.

The contract not only includes the bridge construction but also a section of the Colorado Freeway and reconstruction on Holly Street. Public traffic, however, will not be able to utilize this completed portion of the Colorado Freeway until the adjoining contract to the west, including the bridge over the Arroyo Seco, has been finished. The estimated date for final completion of the Arroyo Seco Bridge and connecting approaches is August, 1953.

At the ribbon cutting ceremony the contractor was represented by the following: Guy F. Atkinson, chairman of the Board of Directors; J. J. Draine, Assistant Area Manager; William T. Colwell, Chief District Engineer; Robert Boyd, Project Manager; and Don Snyder, Administrative Assistant.

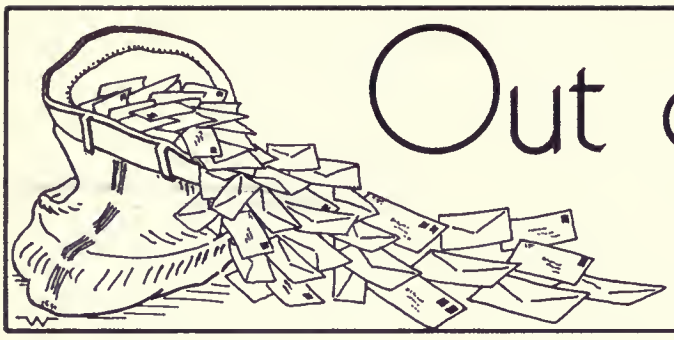


This is the new Orange Grove Avenue Bridge in Pasadena, apened to traffic an December 22, 1952

Officials Attend

The entire Pasadena Board of City Directors was present at the ribbon cutting ceremony. Those members of the board present but not identified in the accompanying photograph are: A. Ray Benedict, Milton S. Brenner, Warren M. Dorn, Seth Miller, and Ray G. Woods. Also attending the ribbon cutting ceremony on behalf of the City of Pasadena were: City Manager Don McMillan; Robert M. McCurdy, Assistant City Manager; William Allen, Administrative Assistant City Manager; Douglas Mackenzie, City Engi-

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Out of the Mail Bag

FROM MANILA

MARC DONNELLY & ASSOCIATES, INC.
El Hogar Filipina Bldg., Juan Luna
Manila, Philippines

Editor, California Highways and Public Works

DEAR SIR: We have received several copies of your excellent publication through our associate, Mr. Howard Weber, who is now visiting the U. S. A. to observe modern construction methods.

Your publication has been of value to us on several occasions and to insure our keeping abreast of happenings in California and the construction field we would sincerely appreciate having our name added to your mailing list. After the various contractors we deal with finish looking at your magazine it is turned over to one of the local colleges having courses in engineering and I am confident it has been of value therein and will help create a better American-Far East relationship.

Yours very truly,

MARC DONNELLY & ASSOCIATES, INC.
By: MARC DONNELLY

THE O'BRIEN ARTICLE

EDWARD J. DE KORT
San Francisca 12, California

MR. KENNETH ADAMS, *Editor*

DEAR SIR: I wish to express my thanks to you and Mr. M. A. O'Brien for the two fine articles of the "History of United States Numbered Highways." The facts set forth so clearly by Mr. O'Brien have indeed answered many of the questions of highway designations.

Your magazine is a pleasure to read and absorb. I am grateful for being on you mailing list.

EDWARD J. DE KORT

ILLINOIS COMPLIMENT

ILLINOIS DIVISION OF HIGHWAYS
Office of District Engineer
Chicago 1

MR. KENNETH C. ADAMS, *Editor*

DEAR SIR: I would like to have my name placed on the mailing list for your fine highway magazine. I feel that it will be a valuable addition to the group of publications which we receive in our district office each month.

Since the State of California is quite a bit farther advanced in expressway work than we are in Illinois, we feel that this magazine will be of particular value in this field.

Yours very truly,

WILLIAM F. BAUCH, JR.
Expressway Traffic Engineer

DIRECTIONAL SIGNS

THE RICHKRAFT COMPANY
Oakland, California

MR. KENNETH C. ADAMS, *Editor*
California Highways and Public Works

DEAR MR. ADAMS:

We have just returned from a trip to Denver, Colo., and you don't know how much we appreciate the work our State Highway Department has done. One particular item—my wife mentioned that she had never noticed the directional signs in California until she got out of the State and noticed the lack of them. For myself, I wish to compliment the State on, not only its new construction, but the maintenance of the present highways.

Sincerely yours,

THE RICHKRAFT COMPANY
C. A. COOK
Vice President—Western Manager

WE ARE GLAD TO HELP

UNIVERSITY OF SAN FRANCISCO
San Francisco, California

KENNETH C. ADAMS, *Editor*,

DEAR MR. ADAMS: I am certainly grateful to you and to your staff for assembling the fine file of your valuable publication. I consider these volumes a real acquisition to our Californiana section in our Gleeson Library here at the university. I have asked our librarian to add his official lines of thanks to these more personal lines, and I know that he will do so.

Thank you again for doing this very fine thing for us and I do appreciate it. The volumes will be used in various research projects in our history program.

Very sincerely yours,

(REV.) JOHN B. MCGLOIN, S. J.
Assistant Professor, History
Department, University of
San Francisco

LETTER FROM AUSTRALIA

19 Langford St., Surrey Hills
Melbourne, Australia

MR. KENNETH C. ADAMS, *Editor*

DEAR MR. ADAMS: I take pleasure again in thanking you for the privilege of receiving your journal. Its widespread distribution makes a valuable contribution to better world relations. The high standard of photography is to be commended. In particular the yuccas on cover of May-June, 1952, were a delight.

The reality of your progress in highways and public works is very stimulating. It encourages us to aim higher in our own spheres of endeavor. We look forward to your further achievement.

Yours truly, ARTHUR O. GYLES.

APPRECIATIVE READER

DEAN P. BECKWITH
Los Angeles 31, California

Editor,
California Highways and Public Works Magazine

DEAR SIR: Sunday papers and current magazines were laid aside for the better part of the day while I perused the pages of *California Highways and Public Works.*

Most of us busy citizens are aware of the small portion of the highways with which we are particularly familiar, but have little conception of the magnitude of the entire State Highway System or the enormous amount of detail required in its planning, construction and maintenance.

The marvel is not "where all the money goes," but rather "how so much can be done with the funds available." Perhaps, nowhere in public affairs are public funds so well authenticated.

Permit me to express to you, personally, a taxpayer's and a motorist's appreciation for a fine job of informative publicity in the bimonthly visits in word and picture.

Very cordially yours,

DEAN P. BECKWITH

HIGHWAYS PRAISED

THE UNION METAL MANUFACTURING CO.
Canton 5, Ohio

January 6, 1953

MR. KENNETH C. ADAMS, *Editor*

DEAR MR. ADAMS: The feature story in the December issue of our publication *The Monotube* was that of the California freeways. We believe you will be interested in reading our article, therefore are sending a copy of the magazine.

We are very grateful to *California Highways and Public Works* for the helpful information which we were able to glean from reading that publication. You Californians are to be congratulated on your fine highways.

Very truly yours

M. E. MILLER
Advertising Department

UNUSUAL LETTER

El Monte, California.
January 5, 1953

MR. FRANK C. BALFOUR
Chief Right of Way Agent
Division of Highways

DEAR MR. BALFOUR: As you know, our home is being purchased for the Ramona Freeway, much as we've wished it would miss us. We were hoping to receive more money for it, however the zoning didn't allow for our office on this property, so we did receive a fair settlement.

Instead of writing the Governor or going to court as some have threatened, we are writing this letter to express our appreciation of the manner in which we've been treated by the men in your department.

Mr. Riley, your appraiser, was very courteous and considerate, and Mr. Walter Routery, your negotiator, has been most courteous, thoughtful and helpful. He has extended every consideration possible. It seems he has the most difficult job of all—informing property owners what they are going to receive—or not receive. He has the quality of being very kind as well as competent, and in our circumstances it is more than appreciated.

So, we thought we'd like to send a little praise along for him instead of a complaint. In other words it's a nasty operation, but he's done it with the least possible pain.

With best wishes for the New Year,

Sincerely,

T. C. RAMELLI
JEANNE RAMELLI

REQUEST GRANTED

MARYSVILLE-YUBA COUNTY CHAMBER OF COMMERCE

January 19, 1953

Mr. Kenneth C. Adams, Editor

DEAR MR. ADAMS: For several years the Marysville-Yuba County Chamber of Commerce has enjoyed and profited by reading your outstanding publication which so accurately and colorfully depicts the activities of the Public Works and Division of Highways Departments. We want to take this opportunity of complimenting you, and your staff, for what is truly an outstanding publication.

We know that you, and members of your department, are anxious to more effectively and thoroughly send your message to those people who are interested in both the present and contemplated activities of the Division of Highways. Because of this, we are taking this opportunity to suggest that you add one more name to your mailing list.

During recent months we have reactivated many of the committees of this chamber of commerce. Our most recent addition to our hard working crew of committees, and committee chairmen, is Mr. Hartley G. Weichert, who will serve as chairman of our highways committee.

Mr. Weichert has asked that I secure for him, late reports and information on highway matters throughout the Northern California area. This we have done. Having read your publication, *California Highways* for the past six years, I believe that this particular publication would be of invaluable assistance to Mr. Weichert in getting a more complete picture of the problems and progress of highways, not only in our particular area, but throughout the State of California.

ROGER B. MCGINNIS
Secretary-Manager

Ribbon Cutting

Continued from page 53 . . .

neer; Duncan Blackburn, Chief Engineer of the Water Department; Henry Garwood, head of the Park Department; and Chief of Police Clarence Morris. Randolph Richards, president, and Guy Brink, chairman of the community development committee, represented the Chamber of Commerce.

Assisting Miss Leah Feland, acting in her official capacity as Queen of the Tournament of Roses in the cutting of the ribbon, were Harrison R. Baker, State Highway Commissioner, and Mayor Abernethy of Pasadena.

Immediately after the cutting of the ribbon the bridge was thrown open to public traffic.

Essential

Public Knowledge of Traffic Engineering Measures Important

By JOHN P. MURPHY, Principal Highway Engineer

PUBLIC KNOWLEDGE of traffic engineering measures is one of the most essential ingredients in developing an adequate street and highway system.

Public acceptance of advances in traffic engineering are as necessary as the technical skills required to develop the devices, measures or designs. Unpopular measures have little chance of achieving the results intended.

These self-evident facts are recognized by public officials, engineers, and enforcement authorities—but in varying degrees—depending usually on the number of sad experiences of the highway official where adequate explanation had not been given the public.

Informotion to Public

Although every advantage may be taken to utilize the latest products of science, the variables of traffic conditions and human behavior are not completely expressable in engineering terms.

Road building is not an exact science, nor is it a static science. The continuously expanding knowledge in the field, coupled with the rapid increase in traffic problems, makes it mandatory that we maintain a flow of intelligent information to the public.

This does not mean that a popular vote must be taken—though in the last analysis that may be what actually occurs. The answer to the problem is a well-informed public.

Contrary to some evidence disclosed by traffic habits, the general public does not lack ability to comprehend basic traffic data.

Some Examples

Let me cite some examples. Where a heavily traveled main highway route intersects an important crossroad carrying considerable traffic volumes for short periods each day, there often is a local hue and cry for a traffic signal. Many of the requested installations would mean establishment of an isolated signalized crossing. Traffic engineers know that an isolated traffic signal, presenting an unexpected interruption of traffic flow, often results in an increase in serious rear-end collisions in the main traffic stream, with no appreciable decrease in other types of accidents at the intersection. Well-prepared explanations of this situation have proved acceptable to local authorities in several instances. The fact that the explanation sometimes has not been completely understood or accepted by a community presents a further challenge to us—it does not mean that the public is unwilling to understand or incapable of comprehending.

Evidence of Public Knowledge

In recent months a specific evidence of public knowledge of traffic engineering data was demonstrated at a community meeting with state highway representatives. To show the need for complete reconstruction of a stretch of highway to divided multilane standards with access control, rather than just adding a lane on each side of the existing highway, a tabulation of accident rates was projected on a screen, showing the California accident rates for two-lane, three-lane, undivided four-lane, multilane divided expressways, and for full freeways. It had been intended to use the tabulation only to show the decrease in accident rates when a median strip and access control are included in the design.

Surprisingly, the audience of some 70 people, typical of a group interested in highway development but not what you might consider technically informed, asked that the chart be retained on the viewing screen while a number of very appropriate questions were asked. There appeared to be no confusion as to the meaning and numerical significance of accident rates and fatality rates. Particular comprehension and appreciation were expressed of the average daily traffic figures for each type of facility.

Period of Greoter Interest

This reaction was especially surprising to the state highway participants in view of previous experiences where citing a vehicle-mile figure as a measure of highway usage and economy in comparing highway routings had resulted only in loss of audience attention.

Apparently we are in a period of greater interest and desire to understand highway needs. Everywhere there are indications that people are willing and able to discuss not only the problems about the highways in front of their businesses and homes but also have shown a definite interest in the larger state-wide problems. We should not fail this opportunity to provide a clear explanation of what we propose to do, why we propose to do it and how the work will be financed.

The public is entitled to know how carefully the highway revenues are being expended. To the many individuals who make up the public this can best be demonstrated by the engineer's sympathetic and never-ending consideration of each local problem—no matter how small.

Public Desires to Be Informed

Probably there is no other field of engineering where public knowledge is so important. This is due not only to the fact that street and highway engineers are generally in the direct employ of the public, but also to the previously mentioned current interest in highway improvement.

You will find that the basic reasoning behind our modern highway designs are as intelligible to the public as they are to us. The public merely desires that it be informed of these factors which the engineer uses in his determinations.

The man behind the wheel of an automobile can appreciate the need of adequate side and vertical clearance at structures; he realizes that grade separation structures are both necessary and

costly; he can understand the dangers of uncontrolled parking and entrance to main traffic lanes; he knows that a median strip contributes to his driving safety and comfort; he is grateful for improved shoulders; it is obvious to him that oversigning can be confusing; it seems to him to be sound economy and an added safety feature to have a periodic replacement program for incandescent lights; the provision of median strip screening against headlight glare appears proper to him, and the erosion control features to prevent slides and slipouts are completely acceptable to him.

Publicity on Speed Zones

All he asks is that he be reminded occasionally of where all of these items pertain so that he can be assured in his own mind that proper weight is being accorded these various elements in the highway designs.

Increased publicity is now being given to establishment of speed zones to advise interested citizens of action taken on a type of request often initiated by a community. The fact that a speed limit much below the normal traffic pace is unenforceable and impractical makes as much sense to the average layman as it does to the engineer. The stressing of that principle is meeting with increased acceptance, and apparently is satisfactory to local groups which have advocated more drastic speed reductions.

In discussions of local traffic problems, particularly where there is an accident history, there is always the danger that negative recommendations of the engineer will appear to argue statistics against human life, dollar economy against bodily injury. These are the most difficult explanatory issues. Feelings and emotions run high and the utmost care must be exercised in the discussion period.

School Crossings

The most critical instance of this type is the ever-recurring request for pedestrian push-button signals at school crossings.

A very fine response by parent-teacher groups has been noted in many instances where an adequate explanation has been given of the inherent drawbacks and accident potential of such installations. The more secure advantages of an adult-supervised crossing guard and the possible too-quick reaction of school children to self-operated pedestrian signals are readily appreciated. The most important factor in these discussions is the sincerity of the engineer in presenting the facts, dissociated as far as possible from the matter of cost.

The item of cost cannot be entirely eliminated from the discussion as payment of adult crossing guards, which cannot be financed from highway funds, is a burden on local budgets. Some assistance in that respect can be given by the engineer, through consultations, to concentrate the permissive crossing locations for children at each school.

Safety for School Children

Some very fine work has been done by the engineers in discussion with school authorities regarding the boundaries of school districts. Where governmental jurisdiction permits a shift in boundaries, it has been possible to minimize the number of school children crossing main highways.

Another instance of acceptable advice from the engineers concerns the location of new schools. We are all familiar with the tendency of authorities to establish new schools adjacent to or near a main thoroughfare. Yet the same authorities will protest most vigorously the routing of a new major highway development in the proximity of a school. This contradictory attitude has been and should continue to be pointed out to affected communities. Satisfactory solution depends on comprehensive planning, with each party being fully advised of the other's problems.

Nonpassing Zones

Despite the many examples of increased public knowledge of traffic engineering measures through explanatory efforts of engineers, there remain many untouched or scarcely touched fields.

One of the most flagrant and dangerous driving practices probably reflects in part a lack of knowledge of the engineering represented. I am referring to the striping of nonpassing zones on two-lane highways. On California state highways the traffic stripe code gives the motor vehicle operator definite information as to the sight distance and passing opportunity ahead. From observation and questioning of many drivers I am convinced that very few have any conception of the care which has been taken to establish this passing delineation nor of the extreme gamble when the special striping is disregarded. Even if the group of reckless drivers is discounted, there still remains a great need for education on this problem.

Rural Traffic Congestion

A further challenge to the explanatory efforts of the engineer is presented currently by proposals being received from thoughtful civic groups and individuals concerned with rural traffic congestion. It has been suggested that immediate traffic relief and accident reduction can be obtained if occasional short sections were constructed to permit vehicles operating at normal speeds to pass slow-moving vehicles.

For many years the policy of the State has been in agreement with the general nature of these suggestions. The main differences between the suggestions and the practice are in the length of section considered worth while and in the location and cost of the sections to be improved.

Most of the suggestions assume that accelerated construction of short sections can be integrated with ultimate design, and without increase in cost.

Clear Thinking Required

The facts are that the congested sections are usually the ones involving large cost, and interim measures on short sections will only in rare instances fit the ultimate reconstruction.

Here is a situation which will require the clearest thinking and the ablest demonstration of conveying essential information to the public.

In the final analysis, public acceptance is based on demonstrated worth of traffic engineering measures. This includes all phases from the broadest planning conceptions to the details with which every motorist has daily experience. In most instances public opinion will reflect the validity of the facts and the ability of the engineers to explain them.

Unsung Heroes

Chief Bridge Engineer Pays Tribute to His Helpers

By F. W. PANHORST, Assistant State Highway Engineer, Bridges

NOW THAT the annual football season is a thing of the past and the heroes of the various bowl games are lauded for their great ball carrying feats how often do you hear of their "blockers"—the men who ran interference, the players who possibly did the work which made the heroes heroes?

The "blockers" who clear the way and do the hard work that makes heroes of others are frequently, maybe almost always, in most large undertakings and organizations. It would seem these unsung heroes should at least rate a pat on the back.

Just before Christmas 23 members of the Bridge Department were presented with "Twenty-five-year-service Awards" honoring them for 25 years, or more, honorable service with the State of California. Among these was Henry Kuphal, Associate Bridge Engineer, who is being picked out as one of the typical—but not the only—unsung heroes in state service you seldom hear of but who has done much in building our great State.



Russian Gulch Bridge, considered the most beautiful on California State Highway System

Designed Four-level Structure

Henry was born in Montana—many years ago—graduated in engineering from the Montana School of Mines and started designing structures when some of us still wore short pants. Most of these years were in the Bridge Department of the Division of Highways and after more than 25 years of service retired four years ago and in December received a large framed certificate with a gold seal, the Governor's signature and others to attest to his faithful service.

While in the Bridge Department Henry designed many of the outstanding structures on the Highway System, the most outstanding one being the four-level structure in Los Angeles which distributes traffic at the intersection of the Arroyo-Seco, Hollywood, Harbor and Santa Ana Freeways. So far as is known, this is the only four-level highway distribution structure built to date.

Many Play Parts

No one man can take full credit for any large undertaking. Those who secure the necessary funds play an important part since no funds, no job. He who visualized the general layout of intersecting highways played a most important part, as did the men who secured the rights of way, the field engineers who constructed various parts at a time and then made them all fit in the final pattern and the contractor and his workers who really transformed the plans into a workable structure. But the designer who put all the grades, curves, and alignment together with a structure of satisfactory appearance with each member as strong as it should be and none stronger than necessary with the resultant structure the most pleasing in appearance and economical cost for the purpose intended is certainly deserving of a pat on the back if for not other reasan than that he secured the best possible structure for the least money for the State thereby saving many thousands of dollars which otherwise could have been lost—and who would know the difference?

The four-level structure was most difficult to lay out since there were four intersecting highways—two straight and two curved. Try to lay out such arrangement without having a column land in the middle of the highway. Where would you place the expansion joints which are so necessary? How large would you make the columns and what shape? How would you calculate the strength of the curved and twisted beams and girders? Think of these things the next time you ride over or under the structure. I think you will admit Henry did an outstanding job.

. . . Continued on page 60

HIGHWAY BIDS AND AWARDS

November, 1952 (Continued)

FRESNO COUNTY—At Weber Avenue in the City of Fresno, a prestressed concrete girder bridge to be constructed and about 0.24 mile of approaches to be graded and surfaced with plant-mixed surfacing on untreated rock base and signals and lighting system to be relocated and revised. District VI, Route 4. Tumblin Co., Bakersfield, $99,962; Trewhitt-Shields & Fisher, Fresno, $111,795; Norman I. Fadel, North Hollywood, $113,888; L. H. Hansen & Sons, Fresno, $166,856; Volpa Brothers, Fresno, $187,818. Contract awarded to Thomas Construction Co., Fresno, $91,363.90.

LOS ANGELES COUNTY—Between 1.0 mile and 0.6 mile southerly of Castaic Junction, truck scales to be installed, a scale house constructed and approaches constructed thereto. District VII, Route 4, Section A. A. A. Edmondson, San Fernando, $41,-951; FEPCO, Los Angeles, $43,866; Byerts & Sons, Geo. K. Thatcher, Los Angeles, $45,179. Contract awarded to Jesse S. Smith, Glendale, $41,463.40.

LOS ANGELES COUNTY—In and adjacent to the cities of Torrance and Redondo Beach, at the intersection of Hawthorne Avenue with 182d Street, semitraffic actuated signal system and highway lighting to be furnished and installed. District VII, Route 164. Electric & Machinery Service, Inc., South Gate, $7,716; Westates Electrical Construction Co., Los Angeles, $7,816; Fischbach & Moore, Inc., Los Angeles, $8,152; C. D. Draucker, Inc., Los Angeles, $8,365. Contract awarded to Ed Seymour, Long Beach, $7,640.

LOS ANGELES COUNTY—Los Angeles River Freeway between 223d Street and south junction of Atlantic Avenue, about 3.8 miles in length, to be graded and surfaced with Portland cement concrete pavement on cement treated subgrade, and five bridges and a retaining wall to be constructed. District VII, Route 167. Webb & White and W. J. Disteli, Los Angeles, $2,695,752; Griffith Company, Los Angeles, $2,783,642; Guy F. Atkinson Company, Long Beach, $2,871,198; Gordon H. Ball and San Ramon Valley Land Co. and Ball & Simpson, Berkeley, $2,892,067; Winston Bros. Company, Monrovia, $2,948,738; A. Teichert & Son, Inc., Sacramento, $2,984,314. Contract awarded to Ukropina-Polich & Kral, San Gabriel, $2,559,019.

MONO COUNTY—Constructing cottage at Crestview Maintenance Station. Joseph A. Schlapp, Bishop, $11,537. Contract awarded to George A. Jarvis, Bishop, $10,835.

SACRAMENTO COUNTY—Between north end of American River Bridge and Route 3 near Swanston Road, about 1.4 miles, roadbed for a four-lane divided highway to be graded and placing untreated rock base on imported subbase material and constructing four reinforced concrete bridges. District III, Routes 98, 3, Sections B,B. Lord & Bishop, Sacramento, $737,113; Fredrickson & Watson Construction Co.—M & K Corp., Oakland, $768,940; A. Teichert & Son, Inc., Sacramento, $777,637; Trewhitt-Shields & Fisher, Fresno, $779,244; Fredericksen & Kasler, Sacramento, $794,881; Tumblin Co., Bakersfield, $801,095; Fredrickson Bros. & Bates & Rogers Construction Corp., San Francisco, $818,959; George Pollock Co., Sacramento, $849,-388; H. Earl Parker, Inc., Marysville, $857,437; John C. Gist, Sacramento, $961,976. Contract awarded to Ukropina-Polich-Kral, San Gabriel, $728,-138.50.

SAN BERNARDINO COUNTY—In the City of San Bernardino at the intersections of E Street with 7th Street, 8th Street, 9th Street, 10th Street and Base Line Street, fixed-time traffic signal systems and highway lighting to be furnished and installed and modified. District VIII, Route 43. Drury Electric Co., San Bernardino, $19,977; Westates Electrical Construction Co., Los Angeles, $21,184. Contract awarded to Fishbach and Moore, Inc., Los Angeles, $19,786.

SAN DIEGO COUNTY—In the City of San Diego, at Friar's Road and near Mission Valley Interchange, existing reinforced concrete pipe culverts to be cleaned and drainage structures to be constructed. District XI, Route 77. Einer Bros., Inc., Escondido, $18,882. Contract awarded to N. M. Saliba Company, Los Angeles, $18,313.

SUTTER COUNTY—At the north end of the Sutter Causeway, about five miles northwest of Tudor, about 0.2 mile, to be graded and surfaced and a portion of existing causeway adjusted to new grade. District III, Route 87, Section B. Clements & Co., Hayward, $53,682; B. S. McElderry, Berkeley, $59,856; Harms Bros., Sacramento, $65,430; J. Henry Harris, Berkeley, $68,446. Contract awarded to Rice Brothers, Inc., Marysville, $46,736.16.

F. A. S. County Routes

HUMBOLDT COUNTY — Between Freshwater and Kneeland Post Office, about 2.2 miles, portions to be graded. District I, Route 971. Claude L. Youngs, Sacramento, $66,220; Humboldt Constructors, Inc., Eureka, $74,799. Contract awarded to J. L. Conner, Jr., Eureka, $51,909.

INYO COUNTY—Between Brown's Camp and Rovana, about five miles, to be graded and surfaced with road-mixed surfacing. District IX, Route 1071. Ball & Simpson. Berkeley, $107,088; R. P. Shea Co., Riverside, $122,819; Pike & Hill, Corey Bros. & Bailey, San Rafael, $131,359; Norman I. Fadel, North Hollywood, $175,113. Contract awarded to Eaton & Smith, San Francisco, $103,971.

MERCED COUNTY—On Santa Fe Drive, between Alaska Station and State Route 123, about 1.6 miles, to be graded and surfaced with road-mixed surfacing and a reinforced concrete bridge to be constructed across Black Rascal Creek. District X, Route 912. Fredrickson & Watson Construction Co., Oakland, $109,642; Thomas Construction Co., Fresno, $114,443; Karl C. Harmeling, Stockton, $116,834; Standard Materials, Inc., Modesto, $126,-122; Huntington Bros., Napa, $126,348; Ted Schwartz, Grass Valley, $126,899; L. B. Wells Construction Co., Visalia, $128,776; Harms Bros., Sacramento, $131,935; B. S. McElderry, Berkeley, $132,-437; J. Henry Harris, Berkeley, $148,707; Norman I. Fadel, North Hollywood, $161,384. Contract awarded to P. J. Moore & Son, Tracy, $103,071.70.

SAN BERNARDINO COUNTY—On Milliken Avenue, between Mission Boulevard and Valley Freeway, about 2.4 miles, to be graded and surfaced with plant-mixed surfacing on imported base material. District VIII, Route 697. Vernon Paving Co., Los Angeles, $153,098; Cox Bros. Construction Co., Stanton, $159,546; R. A. Erwin, Colton, $167,540; Matich Brothers, & Matich Brothers Paving Co., Colton, $171,750; E. L. Yeager Co., Riverside, $171,-851. Contract awarded to George Herz & Co., San Bernardino, $144,685.

SAN BERNARDINO COUNTY — On Alabama Street-Palm Avenue, between State Route 26 and Base Line, about four miles, to be graded and paved with plant-mixed surfacing on imported base material. District VIII, Route 713. George Herz & Co., San Bernardino, $211,377; R. A. Erwin, Colton, $243,323. Contract awarded to Matich Brothers & Matich Brothers Paving Co., Colton, $206,630.

SAN BERNARDINO COUNTY — On Yucaipa Boulevard, between State Route 26 and Bryant Street in Yucaipa, about 5.2 miles, to be graded to provide additional width and surfaced with plant-mixed surfacing on cement treated base and on existing pavement. District VIII, Route 715. R. A. Erwin, Colton, $348,394; George Herz Co., San Bernardino, $359,192. Contract awarded to Matich Brothers & Matich Brothers Paving Co., Colton, $324,629.

SAN DIEGO COUNTY—On Sweetwater Valley Road, between Highland Avenue and Bonita Bridge, about 2.9 miles, to be graded and surfaced with plant-mixed surfacing on cement treated base. District XI, Route 640. Daley Corp., San Diego, $374,360; Cox Bros. Construction Co., Stanton, $376,806. Contract awarded to Griffith Company, Los Angeles, $339,743.20.

December, 1952

BUTTE COUNTY — Across Western Drainage Canal, about 13.3 miles south of Chico, substructure of a bridge to be repaired. District III, Route 3, Section B. C. C. Gildersleeve, Grass Valley, $7,500; Ted Schwartz, Grass Valley, $9,580; R. E. Hertel, Sacramento, $10,731; Rice Bros., Inc., Marysville, $11,533; K. S. Scheyer, El Cerrito, $12,775; B. S. McElderry, Berkeley, $13,495. Contract awarded to Tricon Construction Corp., San Rafael, $6,425.

LOS ANGELES COUNTY—Eleven buildings to be repaired, painted and reroofed at 510 North New Hampshire Avenue. District VII, Route 2. Johnson Company, Altadena, $6,889; Williamson Bros., Pacoima, $8,550; Fowler Construction Co., Los Angeles, $8,860; Carl Orn, Los Angeles, $9,680. Contract awarded to O. B. Phillips, Jr., Long Beach, $6,658.

LOS ANGELES COUNTY—On the Santa Ana Freeway, between Eastman Avenue and Todd Avenue, about four miles, roadside areas to be prepared and planted and a watering system installed. District VII, Routes 2, 166, Sections D,A. Jannoch Nurseries, Altadena, $93,872; D & M Sprinkler Co., Long Beach, $95,456. Contract awarded to Justice-Dunn Co., Oakland, $87,832.35.

LOS ANGELES COUNTY—On Ramona Freeway, between Evergreen Avenue and Helen Drive, about 1.5 miles, roadside areas to be prepared and planted with ground cover, trees and shrubs, and plant-mixed surfacing to be placed over median areas. District VII, Route 26, Section LA,D. Justice-Dunn Co., Oakland, $25,183; Jannoch Nurseries, Altadena, $26,863; Kieth E. Card, Long Beach, $27,934; D & M Sprinkler Co., Long Beach, $38,888. Contract awarded to Henry C. Soto Corp., Los Angeles, $24,-445.75.

LOS ANGELES COUNTY—On Harbor Freeway between 11th Street and Second Street, highway lighting and illuminated sign system to be furnished and installed. District VII, Route 165. Fischbach and Moore, Inc., Los Angeles, $127,675; A. S. Schulman Electric Company, Los Angeles, $128,604. Contract awarded to C. D. Draucker, Inc., Los Angeles, $126,911.

LOS ANGELES COUNTY—On Santa Ana Freeway, between Pioneer Boulevard and 0.3 mile southeasterly of Rosecrans Avenue, about 2.1 miles, to be graded and surfaced with Portland cement concrete pavement on cement treated subgrade, street connections, frontage road, inlets and outlets and acceleration and deceleration lanes to be surfaced with plant-mixed surfacing on untreated rock base; and five bridges and one pedestrian overcrossing to be constructed; to provide a freeway with a four-lane divided roadway. District VII, Route 166, Section A. Webb & White, Los Angeles, $2,499,065; Winston Bros. Company, Monrovia, $2,566,564; Griffith Company, Los Angeles, $2,762,075; Peter Kiewit Sons' Co., Arcadia, $2,915,260.60. Contract awarded to Ukropina, Polich, Kral, John Ukropina, San Gabriel, $2,476,702.40.

LOS ANGELES COUNTY—Between Garvey Avenue and Valley Boulevard, about 1.4 miles, roadside areas to be prepared and planted. District VII, Route 168, Section C, EMte. Justice-Dunn Co., Oakland, $18,344; D & M Sprinkler Co., Long Beach, $19,-242; Keith E. Card, Long Beach, $20,988; Henry C. Soto Corp., Los Angeles, $21,350; Stephen L. Vistica, San Mateo, $23,044. Contract awarded to Jannoch Nurseries, Altadena, $17,911.55.

LOS ANGELES COUNTY—In and adjacent to the cities of Long Beach and Compton, on Los Angeles River Freeway, between 223d Street and Atlantic Avenue, highway lighting and illuminated sign systems to be furnished and installed. District VII, Route 167. Ets-Hokin & Gavin, Wilmington, $113,346; Electric and Machinery Service, Inc., South Gate, $113,571; C. D. Draucker, Inc., Los Angeles, $113,987; Fischbach and Moore, Inc., Los Angeles, $118,517; A. S. Schulman Electric Company, Los Angeles, $118,640. Contract awarded to Westates Electrical Construction Co., Los Angeles, $111,731.

LOS ANGELES COUNTY—At the intersections of Lakewood Boulevard with Gallatin School House Road and Norwalk Boulevard with Washington Boulevard, traffic-actuated signal systems and highway lighting to be furnished and installed. District VII, Routes 168,170, Sections B,A. Fischbach and Moore, Inc., Los Angeles, $28,977; C. D. Draucker, Inc., Los Angeles, $29,971; Electric & Machinery Service, Inc., South Gate, $31,465. Contract awarded to Westates Electrical Construction Co., Los Angeles, $28,111.

LOS ANGELES COUNTY—In the City of Los Angeles, in North Hollywood, at Shop 7 Yard, shop grounds to be graded and paved with plant-mixed surfacing. District VII. Schroeder & Co., Sun Valley, $15,101; A. A. Edmondson, San Fernando, $16,069; McGinnis & Gautier, Inc., North Hollywood, $17,-817. Contract awarded to Griffith Company, Los Angeles, $14,094.50.

MENDOCINO COUNTY—City of Ukiah, at the intersections of State Street with Perkins Street and Standley Street, interconnected semitraffic-actuated signal systems to be furnished and installed. District I, Route 1. L. H. Leonardi Electric Construction Co., San Rafael, $14,799; R. Flatland, San Francisco, $15,482; Underground Electric Construction Co., Oakland, $16,597; Karl F. Stolting, Santa Rosa, $16,714; Arthur B. Siri, Inc., Santa Rosa, $19,875. Contract awarded to Sacramento Electric Works, Sacramento, $14,698.65.

MERCED COUNTY — Between Gerard Avenue and Parsons Street, about 0.4 mile, a frontage road to be graded and surfaced with plant-mixed surfacing on untreated rock base and reinforced concrete bridge to be constructed. District X, Route 4, Section A. Volpa Brothers, Fresno, $52,467; A. A. Edmondson, San Fernando, $52,961; P. J. Moore & Son, West Sacramento, $53,366; Friant Construction Co., Fresno, $54.925; L. B. Wells Construction Co., Visalia, $55,896; Fredrickson Bros., Emeryville, $57,-936; Karl C. Harmeling, Stockton, $57,982; Louis Biasotti & Son, Stockton, $59,081. Contract awarded to Fredrickson & Watson Construction Co., Oakland, $51,931.30.

SAN BERNARDINO COUNTY—At the District VIII Office Building in the City of San Bernardino, landscaping building area. F. A. Tetley & Son, Corona, $9,284. Contract awarded to Charlton Nurseries, San Bernardino, $6,242.65.

SOLANO COUNTY—Across Napa River at westerly city limits of Vallejo, the existing bridge to be repaired. District X, Route 208, Section A. Severin Electric Company, San Francisco, $22,779; Buzzell Electric Works, San Francisco, $23,818. Contract awarded to Enterprise Electric Works, San Francisco, $20,185.

YUBA COUNTY—At the District III Office Building in the City of Marysville, landscaping. Sam E. Hall, Berkeley, $3,803; Capitol Nursery Co., Sacramento, $5,126. Contract awarded to Dana R. Tyson Co., Sacramento, $3,419.75.

YUBA COUNTY—In the City of Marysville, at the intersection of "B" Street with 12th Street, furnishing and installing traffic signal system and highway lighting. District III. L. H. Leonardi Electric Construction Co., San Rafael, $13,058; Westates Electrical Construction Co., Los Angeles, $13,059; Reliable Elevator Works, Sacramento, $13,522; T. L. Rosenberg Co., Marysville, $13,966. Contract awarded to Sacramento Electric Works, Sacramento, $12,342.

F. A. S. County Routes

CONTRA COSTA COUNTY — On Byron Highway, between Alameda County Line and 1.6 miles southeast of Byron, about 3.6 miles, to be graded and surfaced with plant-mixed surfacing on crusher-run base. District IV, Route 610. Clements & Co., Hayward, $197,988; Louis Biasotti & Son, Stockton, $199,242; M. J. B. Construction Co., Stockton, $204,-761; Fredrickson & Watson Construction Co., Oakland, $205,567; Volpa Bros., Fresno, $218,376; Munn & Perkins, Modesto, $221,088; Fredrickson Bros., Emeryville, $223,112; J. Henry Harris, Berkeley, $230,962; A. Teichert & Son, Inc., Sacramento, $234,449; Brown-Ely Co., Contractors, Corte Madera, $247,036; O. C. Jones & Sons, Berkeley, $256,-050; Eugene G. Alves, Pittsburg, $259,954; Leo F. Piazza Paving Co., San Jose, $266,440. Contract awarded to Stephens Trucking Co., French Camp, $197,950.20.

HUMBOLDT COUNTY—On Alliance Road, between north city limits of Arcata and 1.4 miles northwesterly, existing roadbed to be graded and surfaced with plant-mixed surfacing on imported base material. District 1, Route 969. J. P. Breen, Sacramento, $57,786. Contract awarded to Mercer, Fraser Co. and Mercer, Freser Gas Co., Inc., Eureka, $50,-453.40.

LOS ANGELES COUNTY — Across San Gabriel River and over Southern Pacific Railroad tracks on Washington Boulevard, about 2.5 miles west of Whittier, two reinforced concrete bridges and about .34 mile of approaches to be constructed. District VII, Route 635. Oberg and Cook, Gardena, $392,-078; John Strona, Pomona, $395,755; Byerts & Sons and Geo. K. Thatcher, Los Angeles, $397,775; Fredricksen & Kasler, Sacramento, $405,382; Lars Oberg, Los Angeles, $413,830; J. A. Thompson & Son Contractors, Inglewood, $421,019; W. J. Disteli, Los Angeles, $424,940; Norman I. Fadel, North Hollywood, $426,930; Charles MacCloskey Co., San Francisco, $442,835; Griffith Company, Los Angeles, $448,294; Guy F. Atkinson Company, Long Beach, $473,471. Contract awarded to Ukropina-Polich-Kral, San Gabriel, $388,580.

PLACER COUNTY — On Auburn-Folsom Highway, between 6.3 miles and nine miles north of Sacramento County Line, about 2.7 miles, to be graded, untreated rock base to be placed and penetration treatment and seal coat to be applied. District III, Route 768. Ted Schwartz, Grass Valley, $116,-789; Harms Bros., Sacramento, $117,930; J. R. Reeves, Sacramento, $119,899; J. Henry Harris, Berkeley, $134,050; Claude C. Wood Co., Lodi, $159,409. Contract awarded to Paul E. McCollum and C. L. Cypher, Richmond, $116,558.

RIVERSIDE COUNTY—On Lovekin Boulevard, between 18th Avenue and Chanslor Way, about 3.1 miles, to be graded and a bituminous surface treatment applied to imported base material. District XI, Route 735. Basich Bros. Construction Co. and N. L. Basich and R. L. Basich, San Gabriel, $117,-691; R. A. Erwin, Colton. $123,545; George Herz & Co., San Bernardino, $125,212; A. A. Edmondson, San Fernando, $126,766; James E. Roberts, San Bernardino, $127,523; R. P. Shea Company, Riverside, $128,715; Hubbs Equipment Co., Colton, $131,-112. Contract awarded to E. C. Young, San Fernando, $95,374.

Unsung Heroes

Continued from page 58 . . .

Russian Gulch Bridge

Mr. Kuphal designed many other major structures on the Highway System. In the writer's opinion the most beautiful bridge on our, or any other highway system, is the Russian Gulch Bridge, a concrete arch, on the Coast Highway a few miles south of Fort Bragg. Every consideration was given to simplicity of construction details as well as appearance. Henry deserves special credit for this structure not only because it is the most beautiful structure but the most economical that could be built at that particular location.

There are many "Henrys" in the Division of Highways but they are so busy and interested in their work they pay little or no attention to seeking honor, glory or adulation but maybe they acquire a warm feeling of personal satisfaction in seeing their efforts, thoughts and study grow from a lot of calculations and blueprints into a real, useful, economical, beautiful and personally satisfactory structures to be used to the benefit of all the people of our State.

These unsung heroes do a lot of running interference and blocking for other better known heroes. It seems that they should at least once in their life get a public pat on the back for a job well done.

In Memoriam

WILLIAM LEWIS MEGO

District I received a shocking blow with the sudden passing of William Lewis (Lew) Mego, highway foreman at Garberville, on December 28, 1952, at the age of 53.

Lew, as he was affectionately known, started with the Division of Highways away back in the uncertain days of 1922 with intermittent employment until 1928. Since then and until his death he was continuously employed in progressive positions. His appointment as highway foreman came in 1931. The last 17 years of his service were spent in Garberville, except for a stretch with the Seabees in 1945.

He was a member of American Legion Post No. 494 of Garberville and C.S.E.A., Mt. Konocti Chapter No. 19.

Survivors include his wife, Mrs. Velma Mego, Garberville; children, Mrs. Pansy Mercer, Alameda; Miss Patricia Mego, Garberville; Lewis Paul Mego, in the U. S. Navy, stationed at Port McGu; Jack Lee Mego, Garberville; his mother, Mrs. Sarah Thomas, Ukiah; and two grandsons, Billy and Bobby Mercer, of Alameda.

Funeral services were held on December 31st at Fortuna under the auspices of Garberville Post No. 494, American Legion.

The district will miss this valuable employee who has far so long discharged his duties with such credit to himself as to reflect a measure of that credit on the entire Department of Public Works in the eyes of the public.

Gas Tax to Cities

Review of Laws and Rulings Governing These Allocations

By L. V. CAMPBELL, Engineer of City and Cooperative Projects

The Department of Public Works is organized into divisions and the administration of the gas tax allocations to cities has been assigned to the Division of Highways. The Division of Highways headquarters in turn is organized into functions and the various operations of the division are assigned to engineers of the headquarters staff. Each district office in turn is organized on the same pattern as the headquarters office. The field work is carried on by the local district offices which make the direct contacts with the cities.

The expenditure of gas tax revenue on city streets other than state highways was first authorized by the Legislature in 1935. This act authorized the apportionment of one-fourth cent per gallon tax on gasoline among the various incorporated cities in the State on the basis of their population as shown by the last preceding federal census.

Population Basis

Provision was also made to allow for the increase in population of a city by reason of annexation of unincorporated territory, or to determine the population of a city incorporated subsequent to the last preceding federal census by multiplying the number of registered electors residing therein by three. A separate act was passed in 1943, when populations were increasing by leaps and bounds due to the influx of war workers, authorizing the determination of the population by a special federal census. I wish to call attention to the requirement of the act that a certified copy of the certificate issued by the director of the census be filed with the Department of Public Works and with the State Controller.

Unless the certificate is filed with the department, we have no means of knowing that a special census was taken or what the population is. Sometimes a publicity release is filed with the department. Even though it is certified by the city clerk, a publicity release does not comply with the law and is therefore unsatisfactory. I mention this requirement as many times it is overlooked and then the city wonders why it did not receive credit for its increase in population. Much thought and careful study must have been given to the drafting of the original bill. It is remarkably clear in its text and free from what we might call "bugs," or more properly, those parts which ordinarily precipitate arbitrary or controversial opinions. There were scarcely any amendments or additions to the act until the amendment of the Collier-Burns Highway Act of 1947.

Collier-Burns Act Changes

The Collier-Burns Act made two important changes in the allocation of the gas tax revenue to cities. The first, and perhaps the most important, was to increase the allocation from one-fourth cent to five-eighths cent per gallon tax on gasoline. The second important change was to provide that not more than 40 percent of the annual revenue shall be expended for maintenance and that the remainder shall be expended for the acquisition and construction of streets included in the system of major city streets. While the entire one-fourth cent under the original act could be expended for maintenance, it could only be expended for maintenance on major city streets, or as they were called "streets of major importance." Under the present provisions of the act the 40 percent allocated for maintenance can be expended both on major city streets and on secondary city streets. This is a liberalization of the use of gas tax funds for maintenance of city streets.

Expenditures Limited

The act limits the expenditure of gas tax revenue to that portion of the streets available for use by vehicular traffic. It permits such funds to be expended for pedestrian underpasses, or pedestrian overhead crossings, and for the installation and maintenance of traffic control devices. The act forbids the expenditure for street lighting, except for so-called safety lighting, or for the construction or maintenance of sidewalks, or, except as expressly authorized, for the construction or maintenance of any structure or facility, in, over, or under the street which is not of direct and primary service in providing a way for vehicular traffic. Sidewalks may be constructed with such funds on bridges, and sidewalks may be constructed and trees may be planted to replace those removed or damaged by construction or improvement of the street. The above prohibitions and permissions are specified in the code.

Gas tax funds likewise may not be used for setting out, and for the care and watering of sidewalk trees and plantings. While these may be desirable, they may not be considered of primary service in providing a way for vehicular traffic.

It is quite apparent that the intent of the Legislature was to limit the expenditure of gas tax revenue for the exclusive benefit of the motorist who pays the tax. Structures which do not contribute directly to providing a way for traffic may be constructed when such structures are removed or damaged by new construction. That is the principle which guides the department in determining whether an expenditure is proper or not.

To be continued . . .

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Unusual Box Culvert

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Installation Started

Precasting was completed October 9, 1952, and the structures cured under damp mats for seven days after which the mats were allowed to dry.

Installation was started at 6 a.m. Wednesday, November 5, 1952, by placing construction and detour signs and traffic was routed over the detours (one each for north and southbound vehicles) at 6.30 a.m.

Work at the jobsite was started at 7 a.m. with a pavement breaker to cut the asphaltic concrete surfacing. This was followed by a clam shell which excavated a trench approximately 0.2 foot below desired grade. This was dressed up with hand shovels and tamped with a pneumatic tamper after which a cushion course of clean sand was placed and screded to grade.

The box sections were lifted with a truck crane loaded on a truck and semitrailer and hauled to the jobsite, then lowered into the trench with the same crane.

Short Detour Period

Installation was started at the inlet end and proceeded toward the outlet. The second section was lowered into the trench and placed about 1 foot away from the first section. While concrete mortar was being placed on the joints a line from the winch on the transport was placed through the two sections and secured to an 8-inch by 8-inch block placed across the end of the second section. This section was then lifted with the crane to just clear the bottom of the trench and pulled into a snug joint connection by the winch which held a strain until a ½-inch hy 10-inch plate was welded to the angle iron inserts on the side (*Photo 3*). The line was then released and a similar plate welded to the top inserts. Procedure was the same with the two succeeding sections.

Pneumatic tamped backfill of clean sand, crusher run base rock and plant-mixed surfacing was started as soon as the first two joints were coupled and kept pace with the box installation (*Photo 4*).

The road was opened to traffic at 7 p.m. after a total detour time of 12½ hours. The principal difficulty encountered was lack of boom clearance for the crane caused by two telephone cables approximately 18 feet high which cross the road directly above the new installation (*Photo 1*).

No comparative costs for a structure of this size and type constructed in place are available but it is believed that additional cost, if any, would be small especially considering the inconvenience to traffic that would have been occasioned by three weeks of detour.

C. M. Gilliss

Continued from page 49 . . .

partments of schools, welfare, purchasing, flood control and road and survey. With the advent of the Collier-Burns Act of 1947, he was named administrative assistant and attached to the Riverside Road and Survey Department.

He represented Riverside County officials and the county board of supervisors before local and state agencies, taxpayer groups, state and local chambers of commerce, conventions, and legislative hearings.

Gilliss assumed his new duties December 1, 1952. His wife, Alene, and daughters Charlene, age 11, and Donna, age 8, have joined him in Sacramento. He will make public appearances for Director Durkee and the department, with particular attention to representation before the Legislature.

MAKE CAR SAFE

Have your brakes, tires, steering mechanisms, and lights checked frequently. A safe car helps make a safe driver.

EARL WARREN
Governor of California

•

FRANK B. DURKEE
Director of Public Works

•

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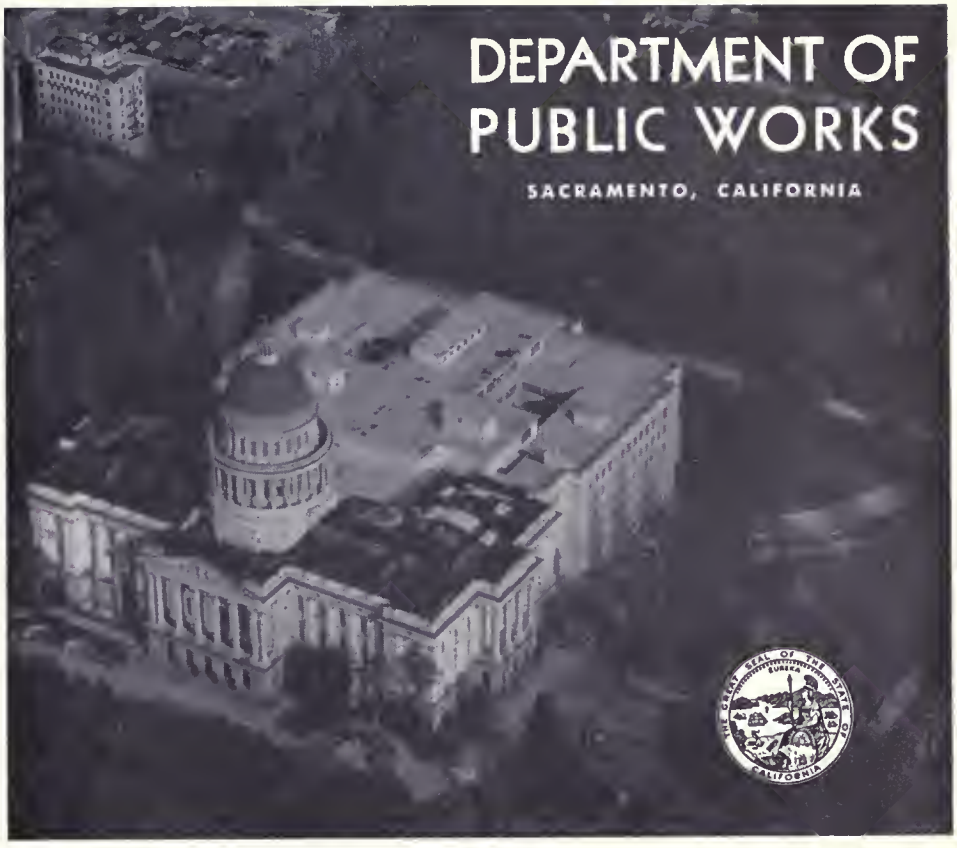
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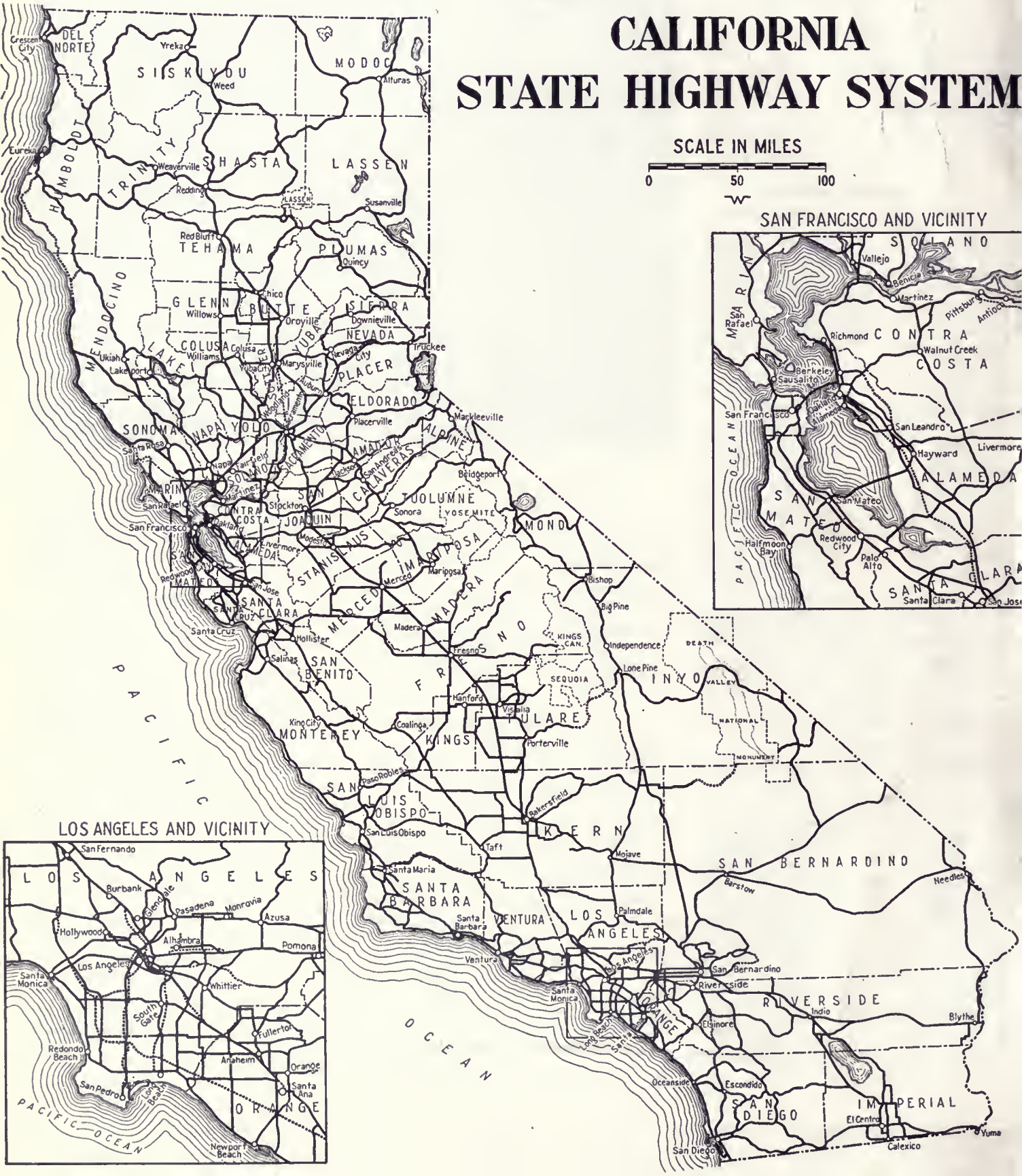
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GEORGE T. McCOY, *State Highway Engineer*

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Problems and Progress on Los Angeles Freeway System

By P. O. HARDING
Assistant State Highway Engineer

A YEAR AGO I gave a report in this magazine on the progress of the freeway system in the Los Angeles metropolitan area, and attempted to portray the role of the Division of Highways in the development of this freeway system.

A brief summary indicates that although the highway system was inaugurated in California in 1912 as a rural system, recognition of the problem through municipalities started as early as 1925 and became general by 1935, at which time both the State Highway System had been extended through the cities, and a ¼-cent allocation of gas tax funds was given to the cities for a system of major streets within each municipality. Coincident with this, and without any increase in revenue, the former rural State Highway System mileage was approximately doubled to its present status of 14,000 miles.

Efforts to obtain additional revenue prior to the outbreak of war in December of 1941 were unsuccessful, and with the stalemate produced by the war, no additional revenue was made available until the passage of the Collier-Burns Act in 1947. The tremendous influx of population, accompanied by unprecedented subdivision development for residential facilities, and the corollary commercial and industrial growth, resulted in an even greater rate of increase in motor vehicle registration.

Critical Deficiencies

This, combined with the general inflation of the Korean War in the brief postwar period, has resulted in the creation of more problems than the funds available can solve. Stated in another manner, the critical deficiencies of $1,470,000,000 on a statewide basis, of 1946, upon which the Collier-Burns Act was based, had increased to some 3 billion dollars by 1951 in spite of the fact that the State had expended over half a billion dollars toward the correction of those deficiencies in the interim.



In spite of the funds being too little and too late, rather notable progress upon a freeway system in the Los Angeles metropolitan area was noted. This had been possible because of the foresight and cooperative efforts of cities, counties and civil organizations in presenting a proposed metropolitan freeway system upon which general and rather widespread agreement had been reached prior to the enactment of the 1947 legislation, which had enabled a start upon the primary state arterials involved in that system.

Creeping Paralysis of Traffic

I stated a year ago that the major justification for the metropolitan freeway is to relieve the creeping paralysis of traffic congestion which has been taking place upon the existing street arterials. We have today in the Los Angeles metropolitan area, more specific evidence upon this statement.

A year ago I cited the traffic upon the Hollywood Freeway which, upon opening in December of 1950, immediately carried 32,000 vehicles per day, and had but a year ago increased to some 99,000 vehicles per day. Present traffic counts indicate that this had at the time of study, 1952, increased to some 112,000 vehicles per day, and coincident with this there has been a relief of traffic on parallel arterials. This relief upon existing arterials has to a large extent been sufficient in scope to make them operate in accordance with the traffic signal controls at the speeds designed for those controls. It has simplified the mass transportation operations upon such arterials and has made these arterials function more efficiently as distributors to the ultimate source or destination of the traffic within the area.

The 613 miles of freeways indicated upon the over-all map here of course include many of the State Highway System and many which may never be built. I recently prepared an estimate of the cost of completing today this entire system, indicating a total cost of some $2,000,000,000. I also completed an estimate of the cost of the creeping paralysis of congestion without such freeway system, and found that within a period of some 12 years this would be equal to the $2,000,000,000 required to complete such overall freeway system.

I similarly prepared an estimate of the economic benefit in the relief, both direct and indirect, given to traffic if this entire freeway system could be constructed. This showed that in less than the 12-year time, the total cost of the freeway system would be saved. In other words, within 12 years' time the net economic gain with the freeway system would be double the cost of that freeway system, which proves the statement made by many eminent authorities, including the Commissioner of Public Roads, T. H. MacDonald, that you pay for these highways whether you have them or not, only you pay more for them if you do not have them.

One of the most forward-looking steps in giving ultimate emphasis toward completing the metropolitan freeway system within the foreseeable future was occasioned by Chapter 20, Extraordinary Session, 1952, providing $10,000,000 for the advance acquisition of rights of way in the paths of freeway routes where imminent development to a higher property usage affecting ultimate freeway costs was apparent. This for the first time has given the Highway Commission the opportunity to adopt routes and permit actual negotiations for vacant lands in the path of the freeway prior to its subdivision for residential, industrial or other developments occurring with such rapidity in this period of extreme growth. Heretofore, the Highway Commission has been forced to follow a policy of adopting these routes only at such time as they could foresee funds with which to actually enter into a program of right of way acquisition, followed within a reasonably short period of time by a program of construction. Heretofore, the adoption of such route gave the State, in effect, an option upon the properties in the paths of the route without any funds to protect the route.

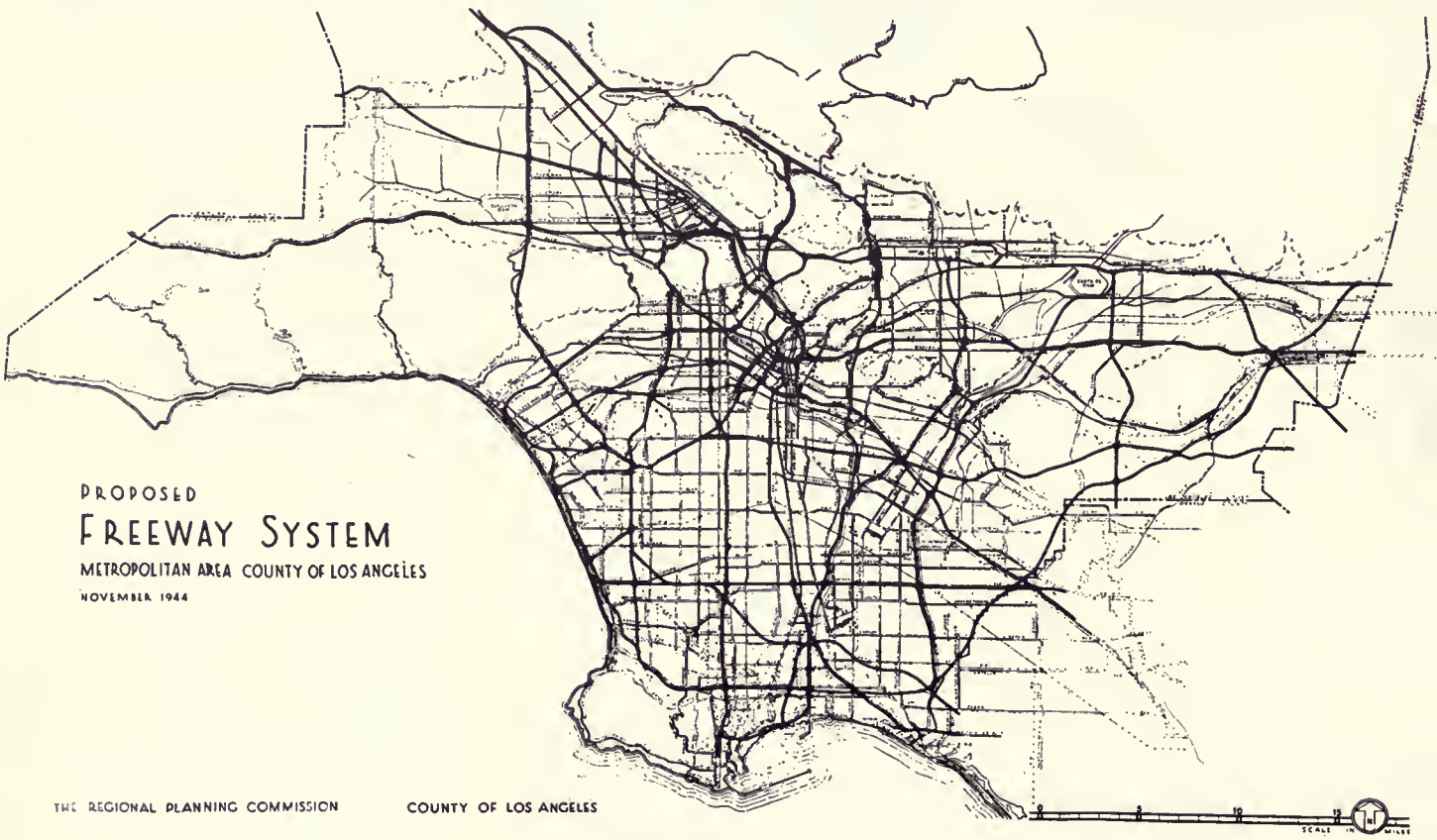
On the other hand, in the face of the glaring need for traffic relief, the commission felt obligated to confine its right of way acquisition to only those projects upon which construction was imminent for the purpose of traffic relief. It would otherwise be scattering its funds over future planning rather than concentrating upon the traffic problem. The new law enables the commission to step in immediately in the adoption of a route, and to proceed immediately with the acquisition of vacant lands subject to subdivision or the erection of expen-

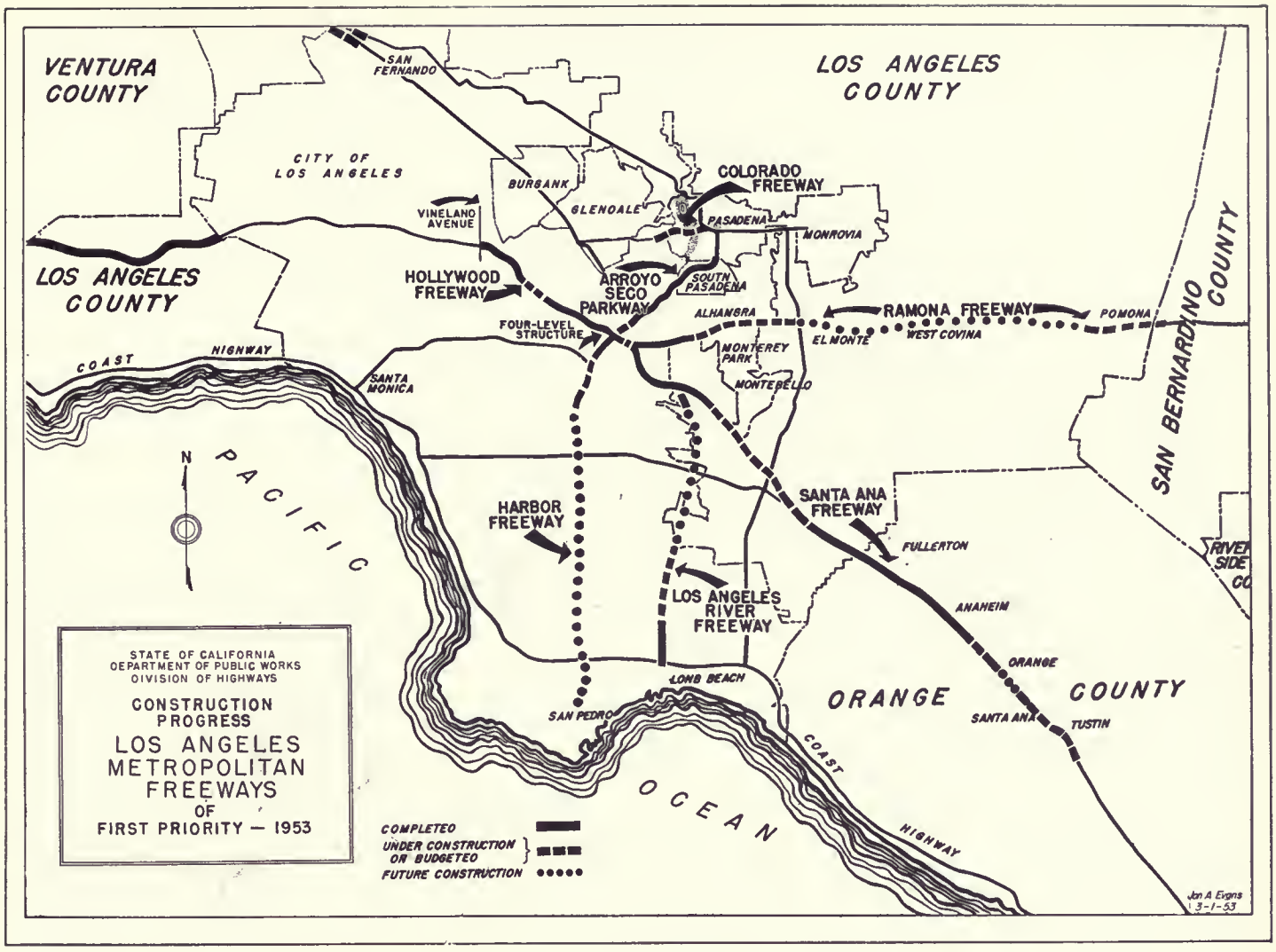
TABLE SHOWING TRAFFIC DIVERTED TO HOLLYWOOD FREEWAY BY PARALLEL MAJOR STREETS

(Figueroa Street Cordon)

Parallel major street	Distance from freeway, ft.	Grand Ave. to Silver Lake Blvd., 1951		Los Angeles St. to Western Ave., 1952	
		Diverted, ADT	Diverted, percent	Diverted, ADT	Diverted, percent
San Fernando Rd. northwest of Ave. 26	11,000	1,500	4	4,500	9
Riverside Dr. west of Figueroa	9,000	7,100	18	14,100	34
Sunset Blvd. west of Figueroa	500	2,800	9	13,100	40
Temple St. west of Boylston	500	9,900	48	10,700	49
First St. west of Figueroa	2,000	7,400	41	6,000	32
Second St. west of Figueroa	2,500	1,900	9	6,000	26
Third St. west of Figueroa	3,100	5,800	30	1,500	7
Fifth St. west of Figueroa	4,500	1,100	8	3,500	23
Sixth St. west of Figueroa	5,000	1,800	13	5,500	39
Wilshire Blvd. west of Figueroa	5,400	700	3	3,500	16
Olympic Blvd. west of Figueroa	10,000	2,700	6	10,100	22
Totals	----	42,700	15.2	78,500	26.5
Traffic remaining on major streets but benefited by freeway				217,500	73.5%
Total traffic on streets involved in study				296,000	100%

The Parkway System as shown hereon was unanimously approved by the Los Angeles Metropoliton Parkway Engineering Committee at a meeting held on February 7, 1946, to which representatives of all cities in the portion of the Los Angeles Metropolitan Area within Los Angeles County had been invited to attend.





sive improvements thereon. As explained a year ago, the ratio of unimproved to improved rights of way may run as high as 10 to 1 for residential properties.

Integrity of Future Route

Another prime advantage is that this permits the Highway Commission to support the heroic efforts of the various planning commissions controlling both unincorporated and incorporated areas to establish and maintain the complete integrity of a future freeway route. This law has permitted activity in protecting vacant properties on previously adopted routes, as well as upon the extended route adoptions permitted. Although this law did not become effective until November of 1952, the commission has already adopted routes totaling 100 miles in Los Angeles and Orange Counties, and contemplates additional route adoptions within a relatively short period of time.

Approximately 60 percent of the $10,000,000 provided under this law has been tentatively allocated to the Los Angeles metropolitan area where the greatest savings in future rights of way costs can be realized. It is hoped that the present session of the Legislature will provide additional funds for continuation of these efforts and for the acquisition of improved properties on such routes which constitute so-called "hardship" cases—that is, people who must sell for some reason or other, and find that they cannot sell to a willing buyer in the path of a freeway where the State will presumably acquire the property within a relatively short period of time. The commission has already authorized acquisition upon the Harbor Freeway, upon the Los Angeles River Freeway (Long Beach Freeway), upon the Sepulveda Freeway, upon the Ventura Freeway, and upon the Hollywood Freeway extension and various other routes. These involve, for this area only, some 300 parcels in relatively large ownerships aggregating over $3,000,000, upon which acquisition has already been started. It is expected that all of the available money will be obligated within a few months' time.

Subdivision Activities

Statements of a year ago should be reiterated, however, that in many cases the development is already here and that the funds appropriated under this act provide no relief for such freeway



Looking northeasterly along Arroyo Seco Parkway from above San Fernando Road



Looking northerly along Harbor Freewoy showing Eighth Street undercrossing bridge construction in foreground

projects. This is under the assumption that fully improved areas are in a static condition, and the tremendous savings afforded by acquiring now undeveloped properties cannot apply to them.

The continued activity in subdivisions within Los Angeles County shows the wisdom of this legislation, for we have been able to catch several sections of freeway upon which subdivisions had already been approved, and thus avoid tremendous future costs of preserving a right of way through these areas.

It will be noted from the map on subdivisions from 1945 to 1952, inclusive, that the totals 1945 to 1951 appeared on the map of a year ago, to which have been added the figures for subdivisions both within and outside the City of Los Angeles.

Construction Progress

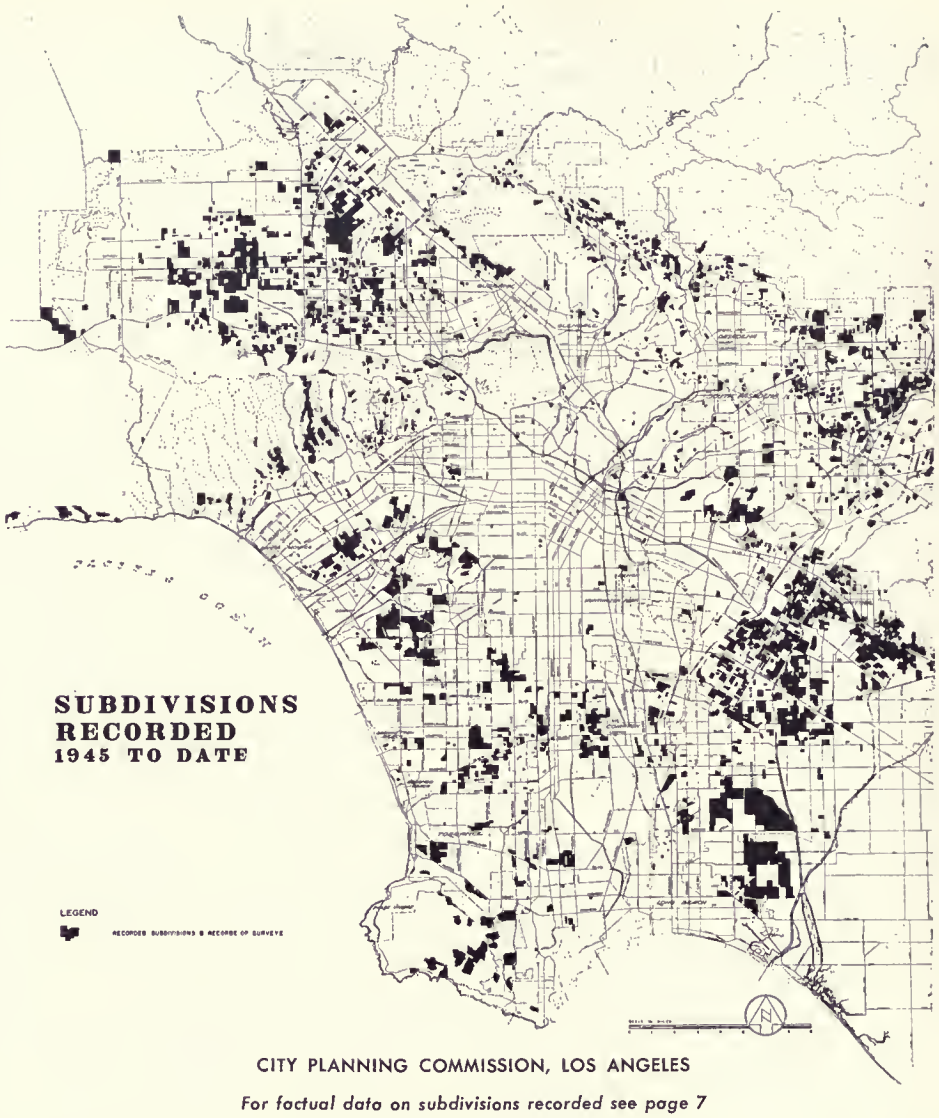
The map showing construction progress has been revised from that shown a year ago, but the true progress made during the year can hardly be reflected on a map of this kind. Our program contemplates opening to public travel each section of freeway as soon as construction operations will permit the public to use it with safety. Each time such section is opened we gain, quickly, valuable origin and destination data by analyzing the traffic flow before and immediately after each opening.

Each time a freeway section is opened to traffic, we know that it moves the point of congestion at the former terminal point to the new terminus. Each time, however, definite benefits are realized in eliminating the conflict with cross traffic within the actual limits of the section opened. Each section eliminates overloaded portions of parallel arterials. And this brings us to an important phase of this problem; namely, the limitations of the metropolitan freeways, particularly in the light of the overload which these freeways must carry until such time as the system can be extended to provide the relief necessary to bring them back to a traffic load which will permit them to operate in line with the basis of their design.

Capacity and Segregation

The freeway is not adapted to segregation of traffic except in line with the designed channelizations for flow in the interchanges and the entrance and exit ramps. As the freeway reaches its practical or designed capacity, it is meeting a critical phase of segregation. As it exceeds the practical capacity, as most of our freeways will for a number of years to come, the efficiency of segregation commences to decrease. The capacity, as previously stated, is based upon a designed volume of 1,500 vehicles per lane of free-flowing traffic, in comparison to an approximate maximum of about 600 vehicles per lane for any surface arterial controlled through traffic signals. These same traffic signals upon surface arterials, however, produce gaps in the traffic, permitting at signal changes appreciable ease in weaving and segregating for proper turning movements ahead, not enjoyed by the overloaded freeway.

Unlike many other engineering facilities, the over-all design capacity of the freeway has its limitations. For example, in sewer or storm drain design the engineer is confronted with the delivery of fluids at certain specified rates from well-defined present or future sources. As the collective effect of these fluids increases, the problem is one of providing a larger and larger conduit for the flow of the total volumes of fluids involved, in which the ultimate destination is well defined by nature. In the case of water supply, the reverse process is largely involved, wherein large volumes of water are taken from sources in nature and gradually distributed to other sources in line with well-established distribution



CITY PLANNING COMMISSION, LOS ANGELES

For factual data on subdivisions recorded see page 7

Subdivisions	City of Los Angeles			Outside City of Los Angeles		
	No. of subdivisions	No. of lots	Lots per subdivision	No. of subdivisions	No. of lots	Lots per subdivision
1945 to 1950	1,136	55,593	49	1,622	108,784	67
1951	255	7,866	30.7	248	17,144	69
1945 to 1951	1,391	63,459	45.5	1,870	125,928	67.7
1952	326	11,329	39.7	325	21,269	65.4
1945 to 1952	1,717	74,838	43.6	2,195	147,197	67

volumes for present and predicted population.

The above table is self-explanatory with reference to the number of lots per subdivision within and outside the City of Los Angeles, those outside averaging over the seven-year period 50 percent more lots per subdivision than those within the city. This indicates the diminishing availability of larger tracts within the city suitable for subdivision, in comparison to outlying areas. It also shows that of the total subdivisions, practically double the number of lots occurred outside the City of Los Angeles, in comparison to those within the city limits. The totals show 3,912 subdivisions with 221,935 lots, or an over-all average of 56.8 lots per subdivision. It is definitely known that much of the subdivision activity has been stimulated by the metropolitan freeway program, which expands the horizon of vehicular travel within given time belts roughly in proportion to the speeds of travel which would exist without the freeways and those which it is possible to attain by use of the freeways.

Traffic Volume Controls

Unlike these problems, the metropolitan freeway may be considered to start with a relatively small volume of traffic and to gradually accumulate traffic on the one hand and constantly discharge it on the other, but with a definite restriction upon the total volume that can be channeled through it. This total volume is definitely controlled by the very traffic having ingress and egress to the freeway, and involves the very uncertain element of human behavior, wherein one individual may affect the progress of many by erratic or unsafe acts.

This has placed a limitation roughly prescribed at four lanes in each direction for freeway travel, and for a number of years past it was thought that three lanes in each direction should be the maximum to be considered. A three-lane freeway from one outside lane to the other, involves weaving across the center lane and merging with the opposite lane. On the other hand, four lanes involves a weaving operation across two lanes and merging with a third to make the transition between the outside lanes. As the volume upon the freeway increases, this becomes more difficult to accomplish.

Definite Limitations

Many times we are asked by citizens why we do not build a super freeway involving many times the number of lanes discussed here. It is quite probable that anyone getting onto such a freeway at one point, intending to depart at some other point, would find it impossible to make the transition without either greatly impairing the over-all speed upon the freeway through weaving conflict provided, or finding it absolutely impossible to make the transition at all, where the practical capacity of the lanes involved had been exceeded.

The city streets to which freeways deliver their traffic also have their very definite limitations, both in traffic capacity and in their much slower speeds of travel. It would be folly to build a freeway which could deliver 6,000 vehicles per hour at high speeds of travel to a garage or parking facility which had a capacity of, say, 6,000 vehicles, but which could only absorb these vehicles at the rate of 3,000 per hour. As a matter of fact, the traffic destined for such parking facility would be able to utilize same with equal efficiency by any traffic-carrying facility delivering vehicles at the rate of 3,000 per hour. As the ultimate source of large volumes of traffic is approached by a freeway, this is a point which must be given most careful analysis, lest the very problem of segregating the traffic be unequal to the facility delivering same, resulting in backing up, and destroying the basic utility of the freeway.

Definite Progress

Coincident with the studies of the problems involved—certain scarcity of critical materials and strikes within the past year—definite progress has been made in extending the freeway system beyond the limits cited a year ago. Since the war the State Division of Highways has spent or obligated some $180,000,000 and has budgeted for the 1952-53 Fiscal Year an additional $32,000,000 on the Los Angeles metropolitan freeway system. The opening of the Western Avenue to Holywood Boulevard section of the Hollywood Freeway on March 16th, under the sponsorship of the Hollywood Chamber of Commerce, was a notable milestone of progress in view of the very heavy congestion of travel on local streets crossing the freeway at a diagonal. This still leaves the Hollywood Boulevard to Cahuenga Pass section of this important freeway under construction, scheduled for opening approximately one year from the present time. There is now open, however, five and one-half miles between the Civic Center and Hollywood Boulevard on this end of the freeway, and approximately three miles on the other end of the freeway, in the over-all 10-mile length involved.

We are now "pulling the plug" between the Arroyo Seco Parkway and the four-level interchange mentioned a year ago, and expect to have this completed late this summer, which will for the first time provide full interchange between the Arroyo Seco, Harbor, Hollywood and Santa Ana Freeways.

Harbor Freeway

On July 30, 1952, a short section of the Harbor Freeway from the four-level interchange to Third Street was opened to traffic. Grade separation bridges have been completed at First, Second, Third, Fourth, Fifth and Sixth Streets and Wilshire Boulevard. Construction work started in 1952 is in progress on grade separation bridges at Seventh, Eighth, Ninth, Olympic, Eleventh, Twelfth, and at Pico and Venice Boulevards. On September 24, 1952, contract was awarded for grading and paving between Third Street and Olympic Boulevard, the estimated date of completion of which is in early



Aerial view looking westerly along Santo Ana-Hollywood Freeway. Los Angeles Civic Center area foreground. Heavy traffic using detours around site for Alameda Street grade separation under construction. Los Angeles Union Railroad Station shown foreground right. Federal Building and other Civic Center buildings shown center left. Four-level interchange structure in background with Harbor Freeway extending to the left and Arroyo Seco Parkway to the right.



Aerial view looking westerly along Ramona Freeway, showing construction in progress. The grade separation in background is at Atlantic Boulevard. Completed section of this freeway recently opened to traffic from Fremont Avenue to Eastern Avenue is shown in background.



Looking easterly along completed portion of Ramona Freeway recently opened to traffic between Eastern Avenue and Fremont Avenue



Looking north along Harbor Freeway, taken from above Olympic Boulevard. Construction in progress is shown between Ninth Street and Third Street. Statler Hotel will be noted center right and four-level interchange structure in background.



Looking easterly along completed portion on Hollywood Freeway from Alvarado Street into Civic Center. This is the section now carrying in excess of 115,000 vehicles per day, which is the subject of study of traffic diversion in the article.



These photos show heavy traffic on Hollywood Freeway sections to which Mr. Harding refers in his article











LEFT—Looking northwesterly along Hollywood Freeway, showing in foreground portion of completed construction opened to public traffic March 16, 1953, as far as Hollywood Boulevard. The section under construction extends from Hollywood Boulevard to Pilgrimage Bridge in Cahuenga Pass shown in upper left of picture with San Fernando Valley in background. RIGHT—Looking toward Los Angeles, showing Santa Ana Freeway under construction. The bridge in foreground is over the Rio Hondo. The bridge in center is over the Pacific Electric Railway and Slauson Avenue. Construction nearing completion is shown in upper portion of photograph and it is expected that this section will be ready to open to public traffic the latter part of April, 1953.

spring of 1954. It is anticipated that we will shortly advertise a contract for completing the grading, paving and remaining structures from Olympic Boulevard to Figueroa Street in the vicinity of 23d Street.

Notable progress has been made in right of way acquisition in the San Pedro area at the southerly end of this freeway, and it is expected construction will follow as soon as right of way acquisition has been completed. On the Harbor Freeway to date there have been 462 buildings moved, 103 demolished, and 15 major contracts have been awarded. Total expenditure for rights of way and construction to date is approximately $30,000,000.

Santa Ana Freeway

The section of the Santa Ana Freeway from Ditman Street to connection with the formerly completed short section in the vicinity of Atlantic Boulevard was recently opened without fanfare, in stages to provide the greatest convenience to the traveling public in coordination with the contractor's work. This is reported to have given such relief to congested Olympic Boulevard, upon which this traffic formerly discharged, that bus routes operating upon that street have been able to eliminate approximately 10 minutes in their operating schedule. It is expected to open by the end of April that section between Atlantic Boulevard and Slauson Avenue just this side of the Rio Hondo Bridge. In the meantime construction is in progress between this point and Norwalk, and this entire freeway, with the exception of one very minor section just this side of Santa Ana, should be opened all the way from Los Angeles to and through the City of Santa Ana in Orange County in early 1954.

Construction is also under way on the important downtown one-third-mile section on Aliso Street between Los Angeles and Lyon Streets, which includes the building of the Alameda Street grade separation structure, with tracks for the Southern Pacific Railroad. This is scheduled for completion by the end of this year, but there yet remains to be constructed the Vignes Street grade separation and the widening of the Aliso Street Bridge across the Los Angeles River, to fully complete this freeway within the City of Los Angeles. In clearing the right of way for the Santa Ana Freeway, a total of 1,171 buildings have been removed and 40 have been demolished. Sixty construction contracts have been awarded in the over-all 32-mile length between the Civic Center in Los Angeles through Santa Ana. Total expenditures for rights of way and construction to date are $45,000,000.

Ramona Freeway

The Ramona Freeway has now been opened to traffic in stages to Fremont

Boulevard in Alhambra, eliminating a temporary bottleneck, saving approximately five minutes to bus operations using the parallel streets. It has all been under contract to Rosemead Boulevard for some time past, and all this work should be completed by December of this year, thus opening to traffic the full 10-mile length from Aliso Street to Rosemead. A contract is now in progress for freeway construction and the building of seven grade separation bridges in the City of Pomona near the easterly boundary of Los Angeles County, and it is expected to advertise almost immediately work which will complete the freeway through Pomona and Claremont. To date, 290 buildings have been removed, 22 demolished, and a total of 27 construction contracts have been awarded in the over-all 30-mile length within Los Angeles County. Total expenditure to date for rights of way and construction is approximately $23,000,000.

Lang Beach Freeway

The Long Beach Freeway (Los Angeles River Freeway), placed in the State Highway System by the Legislature in 1947, has under way at the present time six construction projects between 223d Street and Atlantic Boulevard in the City of Compton. The section between the Pacific Coast Highway and 223d Street was opened to traffic at the first of the year, and work is now in progress in acquisition of rights of way throughout the entire 16-mile length between the Pacific Coast Highway on the south and the Santa Ana Freeway on the north. Total expenditures to date for rights of way and construction are approximately $12,000,000, and right of way has involved the removal of 261 buildings and the demolition of three to date.

Notable progress has been made by the City of Long Beach in extending this freeway southerly of its state limits at the Pacific Coast Highway, and the city expects to open a portion of this freeway north of Anaheim Street almost immediately. The total estimated cost of the city's portion of this freeway is in the neighborhood of $12,000,000, all of which is being financed from other than state highway funds.

Colorado Freeway

The Colorado Freeway Bridge over the Arroyo Seco, joining Pasadena and the Eagle Rock section of Los Angeles, is expected to be completed by December of this year. The Guy F. Atkinson Company, which is building this bridge, is also the contractor on the adjacent section of freeway extending westerly to the Los Angeles city limits and easterly to a connection with Holly Street in Pasadena. To date $7,000,000 has been spent for right of

LEFT—Looking northerly along the Long Beach Freeway (Los Angeles River Freeway), showing in foreground grade separation bridge, with Anoheim Street, o City of Long Beach project, extending to Pacific Coast Highway in center of picture. From this point northerly recently completed by State 2.5 mile section joins with Belhort Bridge in vicinity of 223d Street. RIGHT—Looking northwesterly along Santa Ana Freeway, showing in foreground previously completed one-mile unit in vicinity of Atlantic Boulevard and Union Pacific Roilroad in East Los Angeles area. Section recently opened to traffic joining this completed section with section in Los Angeles City shown in upper left.





Looking northerly up the Arroyo Seco showing in foreground the old two-lane Colorado Street Bridge built in 1912 and the new Colorado six-lane freeway bridge under construction. The famous Rose Bowl will be seen upper center, left. Northwesterly portion of Pasadena and community of Altodena shown in background.

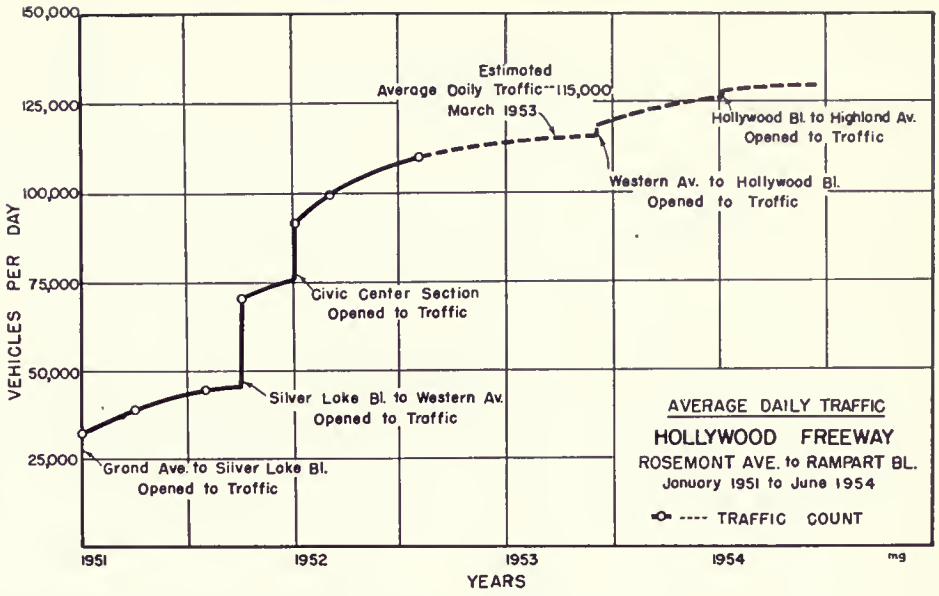
way acquisition and construction on this freeway, in which 27 buildings have been removed and 13 demolished.

It should be noted that the last unit of the Ridge Route between the north city limits of Los Angeles and the Kern County line has now been completed at a total cost of $14,000,000 for the 45.2 miles of this expressway. A contract has been advertised to extend this from the north city limits into a connection with Sepulveda Boulevard.

Right of way acquisition is proceeding upon the Alessandro Freeway, the Sepulveda Freeway, and sections of the Ventura Freeway. Contract work in Ventura County on this latter freeway will provide a grade separation at the town of Camarillo.

Los Angeles County recently opened to traffic a section of expressway from roughly Stocker Street to Jefferson Boulevard, which now extends this expressway from the City of Inglewood to Jefferson Boulevard in the general route indicated on the map for the Crenshaw Freeway.

One of the glaring defects indicated by the construction progress map is that it shows no activity upon a freeway extending westerly from the central business area of Los Angeles. We have long recognized the need for such freeway, but the overloaded condition of the Hollywood Freeway during its brief life of service has made it necessary that we reappraise the situation to determine whether a Santa Monica Freeway extending to the west, or a Venice-Olympic Freeway farther to the south, should be given priority, or whether it would be possible to determine upon some compromise route giving equal or better service. We have recently completed the initial phases of a traffic study for the entire western area, and are at the present time supplementing this by a vehicle use survey which will give us origin and destination data having a direct bearing upon the problem. Additional finances, if provided by the Legislature, should permit us to crystallize our thinking into action in providing the best facility possible for this very important area in this metropolitan district.



The latest figure on vehicular registration in Los Angeles County, as of the end of 1952, is 2,225,938 vehicles. There are only six states, other than California, having more registered vehicles than this single county within California. These are New York, Illinois, Ohio, Pennsylvania, Texas and Michigan.

Showing Wilton Avenue, Fountain Avenue and Western Avenue. Photo taken from top of KTTV Studio Building.



U.S. 70-99 Freeway

Pomona-Claremont-Ontario-Upland Section Under Construction

By L. S. VAN VOORHIS, Assistant District Engineer, District VII, and JACOB DEKEMA, Assistant District Engineer, District VIII

One of the vital links in the U. S. 70-99 Freeway will soon relieve the congestion through Pomona, Claremont, Upland and Ontario. Three contracts are currently under way for the construction of 14 grade separations in District VIII and seven in District VII and two bridges across major drainage channels financed by the 1952-53 Fiscal Year Budget. These contracts total $2,836,000.

On October 22, 1952, the California Highway Commission adopted the State Highway budget for the 1953-54 Fiscal Year which provides for the completion of this 13.4-mile portion of freeway. Four million one hundred thousand dollars has been allocated for the 6.2 miles in Los Angeles County from San Dimas Road to the San Bernardino county line at Mills Avenue. Completion of the 7.2 miles from there to a junction with the existing expressway east of Ontario at Archibald Avenue is to be financed from the $3,200,000 provided therefor by the commission.

Ten Million Dollar Project

Thus, a total of $10,136,000 has been budgeted for construction of 13.4 miles of four-lane divided, high standard, full freeway.

The various structure contracts are expected to be completed late in the summer of 1953, but contracts for grading and paving can commence well before completion of the bridges. The District VIII portion was advertised for bids to be received March 12, 1953, with the District VII section to follow immediately thereafter.

Three more grade separations and three pedestrian undercrossings are to be built in Los Angeles County as part of the future contract. Traffic is expected to use the completed freeway in 1955.

The proposed freeway is on new alignment for its entire length as shown on the accompanying artist's sketch.

The route selected is slightly longer than the existing highway, but the savings in right of way costs on the adopted location are large enough to more than offset the cost of additional length of travel.

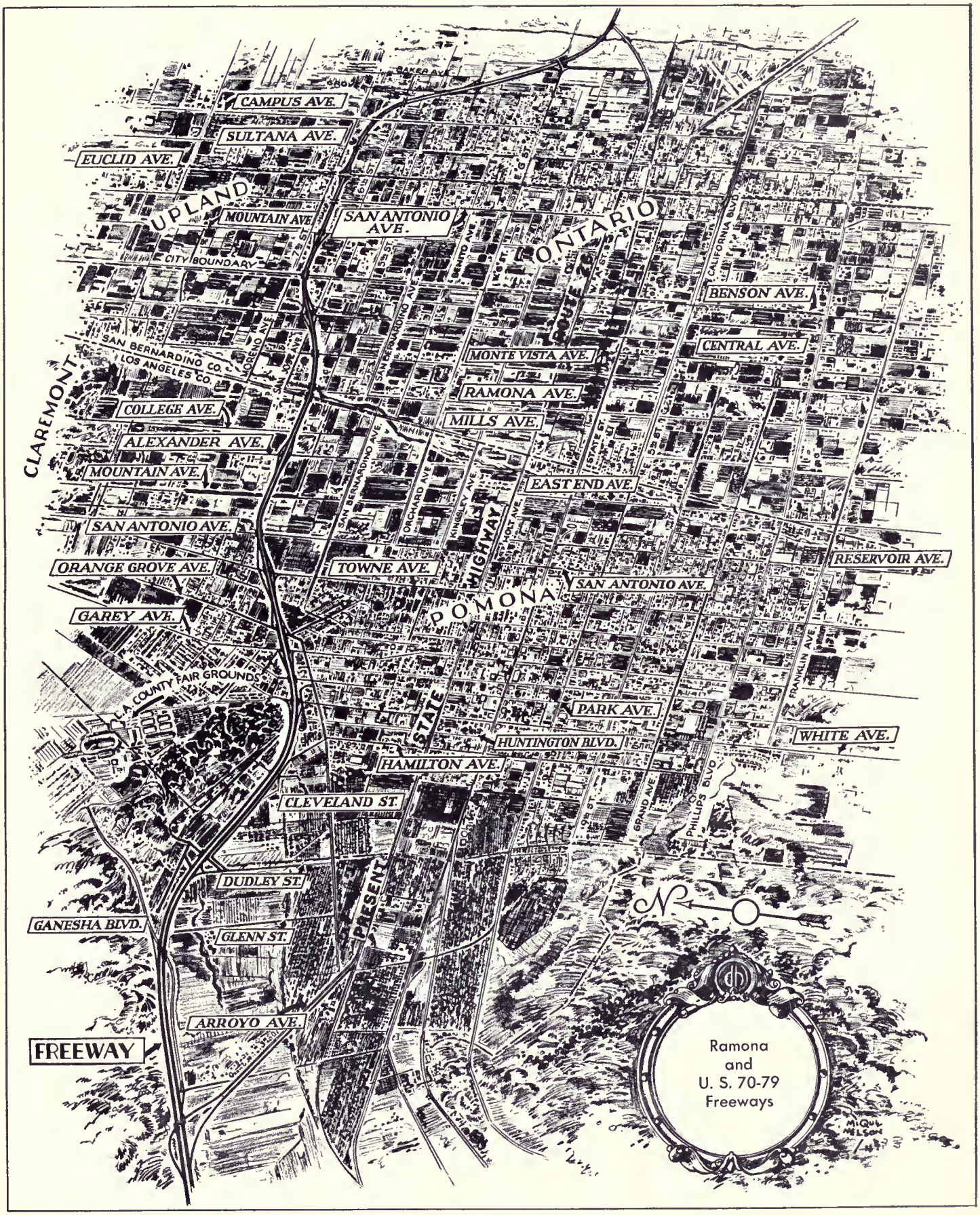
The existing traveled way passes through considerable roadside development, and restricted speed zones have been established over the major portion of the section which will be superseded.

To Relieve City Congestion

Completion of the work is anxiously awaited by citizens of Pomona, Ontario and adjacent communities to permit moving the heavy through traffic on U. S. 99 and U. S. 70 from present city streets to the new freeway. When this has been accomplished, it will again be possible for motorists to park easily, cross the street safely and shop

Looking toward Ontaria through the Guasti vineyards at the east end of the project





In Los Angeles County the Ramona Freeway is known by that name. When it crosses the San Bernordino County line it becomes U. S. 70-99 Freewoy.



Section of freeway through City of Pomona, showing present Route 26 in foreground. The Los Angeles County Fairgrounds is shown in center left and Ganesha Park center right. The snow-covered peak in background left is Cucamonga Mountain.

leisurely in the thriving business sections of these outstanding California cities. As local shoppers and those from surrounding areas discover the convenience and comfort created by removing the noisy hazardous through traffic from Holt Avenue in Pomona and A Street in Ontario, a healthy increase in sales may be anticipated.

There are nine traffic signals in Los Angeles County and eight in San Bernardino County.

It is conservatively estimated that the driving time through the Pomona and Ontario Area will be reduced 50 percent when the freeway is completed.

Plan Ultimate Six Lanes

This project was reported upon in this magazine in the July-August, 1950, issue announcing execution of

the freeway agreement with the City of Pomona and as a part of a general discussion of the route by Assistant State Highway Engineer P.O. Harding in the September-October, 1951, issue.

The entire length of the two grading and paving contracts will be constructed as a four-lane freeway with provision for ultimate expansion to six lanes by the addition of two lanes in the median area. The lanes of the traveled way will consist of Portland cement concrete pavement. Shoulders, auxiliary lanes and ramps are to be plant-mix surfacing.

The interchanges in the Pomona-Claremont area are of several types with the diamond shape used predominately. These points in ingress and egress are located at important cross streets and are, in general, evenly spaced throughout the area. The braided connection with the existing traveled way near the westerly end of the project will not only provide a convenient entrance to Pomona but will also become the junction of two freeways. Upon completion of the freeway, the westerly one mile of existing Route 26 will become Route 77. The latter route has been declared a freeway from its junction with the Ramona Freeway to the San Bernardino County line. The freeway also crosses State Route 19 which is Garvey Avenue. This route, carrying approximately 10,000 vehicles per day, is the most important connection between Foothill Boulevard, State Route 9, and Pomona.

Diamond Type Interchanges

Diamond type interchanges are being constructed in the Upland-Ontario area which will permit traffic to move in the direction desired without circuity of travel. The anticipated volume of left-turn movements is relatively low and does not justify the high right of way cost involved in the construction of cloverleaf loops. At the east end of the project, a direct connection to the old highway is provided, affording safe and convenient access to the Ontario business section from the east.

It is anticipated that the contractors will arrange with the San Bernardino County Flood Control District to obtain large volumes of imported borrow at locations where the excavation of material will be of substantial benefit to the retarding basin construction program under way by the Flood Control District. Similar arrangements are anticipated with the Pomona Valley Protective Association.

Take Care of Storm Waters

The Cities of Ontario and Upland are built on a debris cone and in this entire area, the north-south city streets serve as storm channels during periods of heavy rainfall. An existing storm drain along Eighth Street in Upland, one-half mile north of the freeway, intercepts all the runoff in the Upland area except the most severe flood flows. By reconstructing the city streets at their existing grade at the various overcrossings, the bridges will act as flumes to carry excess storm water harmlessly over the freeway. The depressed portion of the freeway between San Antonio Avenue and Sixth Street drains by gravity flow into Cucamonga Wash.

In the Claremont-Pomona area, also, the drainage is to be carried in the existing north-south streets. Since the freeway is to be constructed on a grade above natural ground, no drainage problems are encountered where streets are bridged. On cul-de-sac streets, the surface water is carried under the fill by means of the low-wide structures, whose shape is adapted to the wide-shallow street flow. The recent storm drain bond issue proposal voted by the people in Los Angeles County promises to provide modern underground storm drains for the more critical areas in which flooding is being aggravated by the rapid change in use of the land from agricultural to residential development. Every effort is being made to correlate the freeway design and construction with that of the local agencies to promote the maximum drainage protection for residents and highways alike.

Famous Boulevard

The City of Ontario was founded in 1882 by George and W. B. Chaffey who named it after the Canadian province from which they had emigrated. The city was incorporated in 1891 with a population of 800. Upland, Ontario's sister city to the north, was incorporated in 1906. A large portion of the new freeway in District VIII is being constructed along the joint boundary of the two cities, but with grade separations at numerous intersecting streets, the two communities will be drawn closer together as they will hardly be aware of the heavy traffic flowing on the freeway.

The two cities' major connection is by means of Euclid Avenue, one of California's most renowned scenic attractions. Eighteen miles long, 200 feet wide, this boulevard extends from the foothills on the north to the valley on the south. Its two roadways are separated by a wide median planted with pepper trees by the Chaffeys in 1883 and 1884. With its emerald green lawns and giant pepper and grevillea trees, the broad avenue is beloved by neighboring citizens and admired by thousands of tourists each year.

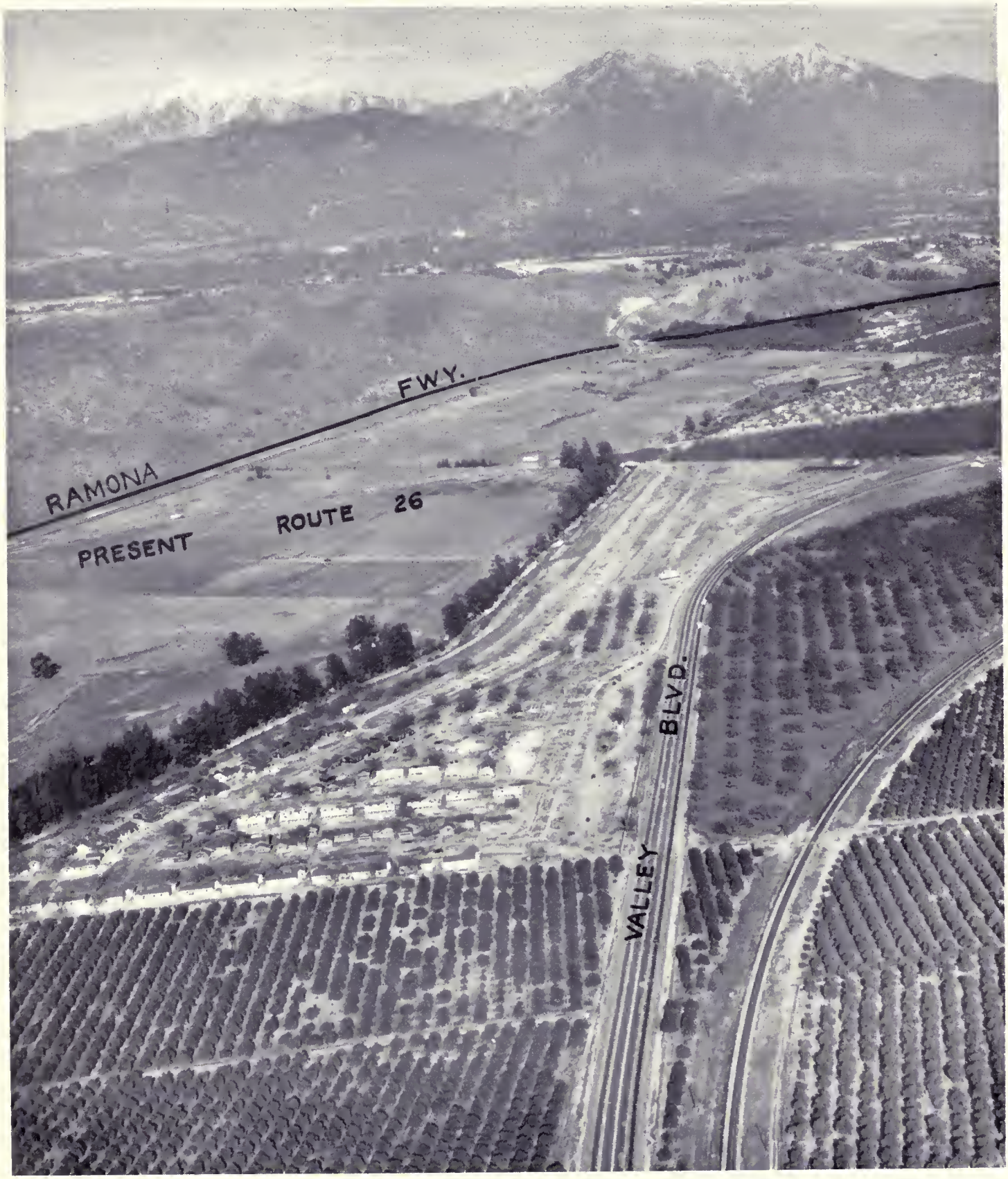
Beautification Planned

The interchange at the freeway and Euclid Avenue will provide the main access for the cities, Upland and Ontario, to the freeway. Construction at the crossing is being performed in a manner that will in no way mar the beauty of the boulevard. The communities have started a movement for the establishment of a park at the intersection to further enhance the attraction and to encourage the hurrying motorist to pause and relax.

Easterly of Upland-Ontario, the freeway passes through the largest vineyard in the world—5,000 acres extending from the mountains to Guasti on the south. Headquarters for the vineyard is in Guasti while in nearby Cucamonga will be found the oldest winery in California, established in 1839.

The City of Pomona, named after the Roman Goddess of Fruits and Gardens, was founded on August 20, 1875. Located in the old Rancho San Jose, first settled by the early Spanish Dons, and surrounded by miles of fertile hills and valleys, Pomona gained early prominence as an important agricultural and trading center.

By 1887, the year of incorporation as a city, Pomona boasted of a population of 3,500, with schools, a newspaper, churches, banks, fruit canneries, nurseries and hotels.



Western section of freeway entering City of Pomona. In the foreground is shown initial unit of $100,000,000 Liberty Homes development that will embrace substantially all of the area shown in the photograph between the freeway and the Southern Pacific Railroad. In the background left is Mount Baldy and, right, Cucamonga Mountain.

Renowned Pomona Fair

Today Pomona is a thriving city having upwards of 40,000 people residing within her 14 square mile area. With her fine residential suburbs, shopping districts, industrial developments, beautiful parks and trees, churches and schools, Pomona represents one of the well-integrated, prosperous cities of Southern California. Being the home of the Los Angeles County Fair, the largest county fair in the world, with its magnificent representation of cultural, industrial, agricultural and commercial achievements of our great Nation, and also the home of the famous Kellogg Arabian Horse Ranch, now called the Kellogg Unit of the California State Polytechnic College, Pomona attracts over a million visitors each year.

The route of the freeway follows very closely the old Los Angeles and San Bernardino Stage Road which passed along the southerly side of Ganesha Park and joined the historic Butterfield Stage Route at a point which is now Pomona's westerly city limits.

Freeway Helps Land Values

During the negotiations with Pomona to reach a freeway agreement, the greater share of the property traversed by the freeway route was devoted to citrus groves. A considerable amount of opposition to the freeway was based upon the premise that the freeway would be a blight on the contiguous land and seriously reduce its value. At the present time, statistics on building activity show the Pomona area to be one of the fastest growing communities in Southern California. The value of building permits for 1952 were in excess of four times that for 1951. Mayor Alan Orsborn of Pomona recently announced publicly that the subdivision activity in the vicinity of the freeway is such that there is practically an absolute lack of land immediately adjacent to the freeway that is not now in actual construction of homes or contemplated for subdivision purposes.

In addition to the bridge construction previously mentioned, the major items of work involve 1,930,000 cubic yards of roadway excavation, 1,921,000 tons of imported material, 58,400 asphaltic plant-mixed material and 86,200 cubic yards of Portland cement concrete pavement.

The distance from the junction with the Santa Ana Freeway in Los Angeles to Colton is 52.7 miles. Upon completion of the Pomona-Ontario unit, there will be 22.8 miles of full freeway and 14.7 miles of expressway open to traffic, which leaves 15.2 miles of full freeway in Los Angeles County remaining to be constructed.

T. H. MacDONALD PRAISED

The California Highway Commission at its meeting in Sacramento on March 19, adopted a resolution commending U. S. Public Roads Commissioner Thomas H. MacDonald, who retired on April 1st, for his many years of devoted service in the development of modern-day highways. Secretary of Commerce Sinclair Weeks appointed Francis V. du Pont of Wilmington, Delaware, to succeed MacDonald. The commission's resolution is as follows:

Whereas, The Honorable Thomas H. MacDonald is retiring after 34 years of public service as Commissioner of Public Roads; and

Whereas, During these long years of service, Commissioner MacDonald has championed a national system of good roads and made an outstanding contribution throughout the Nation; and

Whereas, Commissioner MacDonald has received national and international recognition in his chosen field of endeavor; now, therefore, be it

Resolved, That the California Highway Commission in regular session this nineteenth day of March, 1953, convey to Mr. MacDonald its sincere appreciation for his contribution to good roads and its best wishes for a continued interest in the future development of the Nation.

In Memoriam

JAMES M. HODGES

Funeral services were held on March 18, 1953, for James M. Hodges, retired Supervising Highway Engineer for the State Division of Highways, who died in Alhambra on March 14th. Mr. Hodges was born March 13, 1894, at Loveland, Colorado. He was a graduate of Los Angeles High School

"Jim," as he was known throughout the State, started his highway service with District VII on December 28, 1914, as an axeman on one of the survey parties on the original survey for the "Old Ridge Route." From December 12, 1917, to August 1, 1919, during World War I, he was on military leave with the Army in France. Upon his return to civilian life, Jim advanced through the various survey party positions and was instrument man at the time he left District VII on May 18, 1920, when he resigned to accept out-of-state employment.

Jim returned to the State Division of Highways service December 1, 1928, to accept a position as Resident Engineer in District VIII. When portions of Riverside County and Imperial County were relinquished by District VIII in 1933 to become a part of the new District XI with headquarters in San Diego, Jim automatically became an employee of District XI.

On April 25, 1936, Jim transferred to Sacramento Headquarters Office where he worked for a period of five years. On March 16, 1941, he became District Maintenance Engineer for District IX, with headquarters in Bishop, which position he held until August 1, 1947. On this date Jim transferred again to Sacramento and worked until March 23, 1949, on the office engineers' staff.

He then returned to District VII as Assistant District Engineer in charge of surveys, which position he held until his retirement on May 1, 1952.

His home during recent years has been at 2220 Winthrop Drive, Alhambra. He is survived by his wife, Mrs. Grace A. Hodges, his mother, Mrs. Annie Hodges, and his brother, Joel B. Hodges.

The One-way Street

Its Effect on Retail Business

By JOHN F. KELLY, Headquarters Right of Way Agent

The purpose of this economic study conducted by the California Division of Highways is to determine how retail business is affected when the traffic on city streets is changed from two-way to one-way, particularly when those streets are part of the State Highway System. The one-way street system has the full support and cooperation of the traveling public because these new thoroughfares have been a benefit to them. However, the unanswered question is, "Has this benefit to the traveling public been at the expense of retail business along the newly created one-way streets, or has it also benefited from the change in the traffic pattern?"

Diversified Improvements

For making this one-way street study 16th Street in Sacramento has been selected because the majority of the street frontage is utilized for commercial uses, varying from small retail stores to one of the largest automobile dealerships in the city. This northbound one-way street extends 2.4 miles through the heart of the city. Portions of U. S. Highway Routes 40, 50 and 99 through Sacramento use 16th Street. The diversity of improvements on 16th Street makes it an excellent example to be used for comparing the activity of retail business in other communities either now using or contemplating using one-way streets in the future. After all, the importance of any economic study is to provide a factual report which can be used as a reference and guide by other communities which are confronted with similar problems.

The network of streets in the central portion of Sacramento follow a grid pattern. The accompanying diagram shows the major streets and highway routes in this section of the city. Traffic congestion has been relieved considerably in the central area of the city by converting several of the heavily traveled two-way streets into one-way thoroughfares. At present, there are nine north and southbound, and six east and westbound one-way streets.

City Traffic Studies

Since adopting the one-way street system on a limited scale, the City of Sacramento has carefully studied the effects of this change. The primary purpose of their studies has been to determine how much the one-way street system has improved traffic conditions.

The following resume briefly outlines the results of the studies completed by the city:

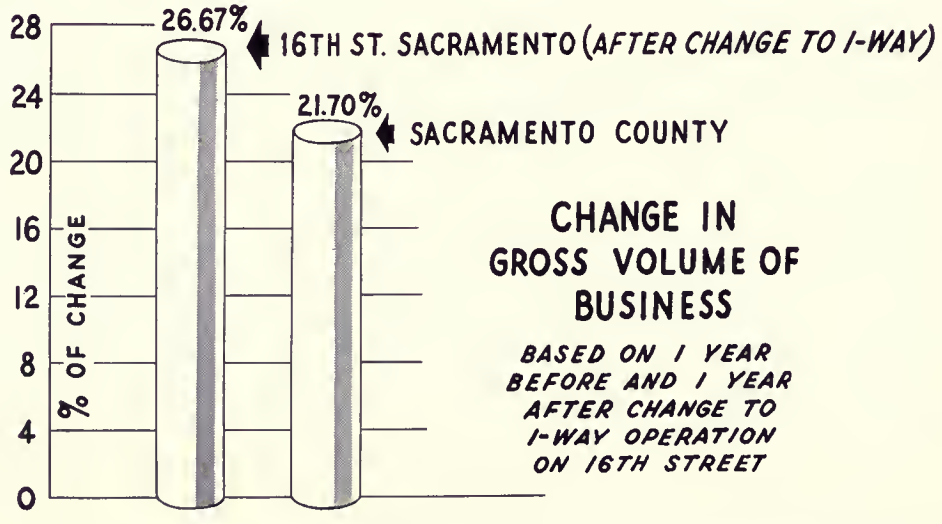
1. Traffic volume increased 14.0 percent on the pairs of one-way streets as compared with these same streets when they were two-way streets.
2. Traffic speed during one-way operation increased 24.4 percent in peak hours and 41.4 percent other hours.
3. Vehicle accident rate reduced an average of 15.5 percent on the one-way streets.
4. Pedestrian accidents reduced by an average of 61.9 percent on all streets converted from two-way to one-way.
5. Greatly enlarging the one-way street system indicates a need of changes in the local bus routes.
6. The effectiveness of one-way streets is being hampered by commercial vehicles double parking and blocking one of the traffic lanes. Increase in number and size of curb loading zones may be one of the best corrective measures.
7. Local business groups have expressed satisfaction with changes made from two-way to one-way streets and are encouraging the city to increase the number of one-way streets.

In general the results of the studies made by the city show that from a *traffic* standpoint, the change from two-way to one-way has been a success.

From a land economic standpoint this study deals with the effect of the one-way street on the adjoining property, particularly retail business. In this phase, a separate segregation of traffic and accident figures has been made for the purpose of confining all factual data to the study period.

Two-year Study

This two-year period is a comparison of the one year of two-way traffic with one year of one-way traffic. The study period began on July 1, 1949, and ended June 30, 1951. The dates of the study do not coincide exactly with the dates on which 16th Street was



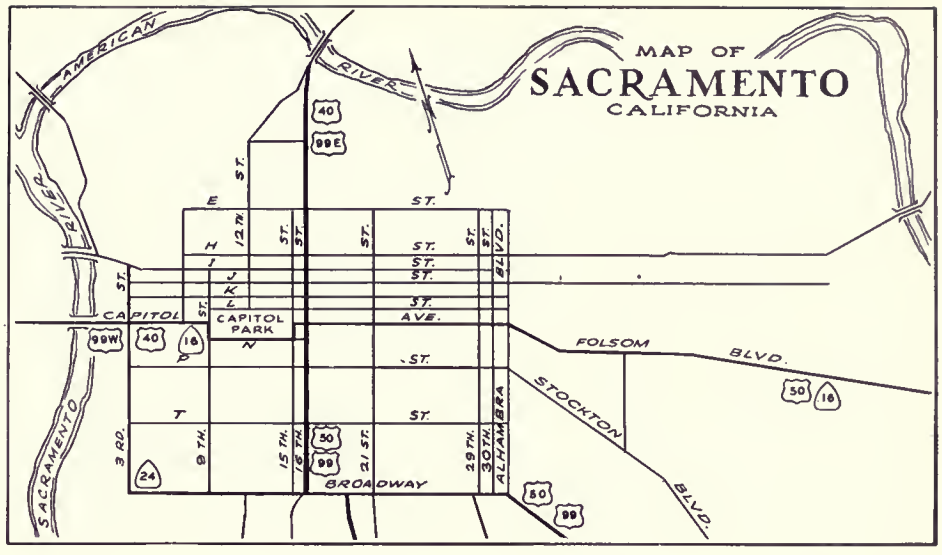
converted from two-way to one-way traffic. The gross sales are reported on a quarterly basis and for an accurate interpretation of these figures we have used the quarterly date nearest the actual date on which traffic was changed on 16th Street. Adjustments have been made for the difference in time so that the study accurately covers two identical 12-month periods.

Retail Business

The sales tax returns as reported by each retail outlet on 16th Street to the State Board of Equalization provides the facts for making the retail business study. These facts show that all retail business on 16th Street during the year of one-way traffic increased 26.57 percent over the previous year of two-way traffic. To determine if this increase is above or below the normal expectancy for change in retail business during this particular time, a comparison has been made of all retail business in Sacramento County. During the same comparative time period, all retail business in the county showed an increase of 21.70 percent. This means that retail business on 16th Street made a 4.87 percent greater increase during the year of one-way traffic than all retail business throughout the county during that same year. The use of county figures for comparative purposes is based on the fact that previous studies have shown that business in the City of Sacramento sets the business pattern of the county.

Corner Sites

Several major streets cross 16th Street and provide very desirable corner locations for retail business. A segregation has been made between the retail outlets located at corner locations and those having their entire frontage on 16th Street. The figures reveal that all business on corner locations made an increase of 26.90 percent during the year of one-way traffic as compared with the year of two-way travel. Those retail outlets having their entire frontage on 16th Street and without the influence of major intersecting streets made business gains amounting to 25.39 percent during the year of one-way traffic. It is interesting to note that the gross business performed at corner locations



represented 78.24 percent of all business along 16th Street and the remaining 21.76 percent of total business was done by outlets having frontage exclusively on 16th Street. These figures show that although the greatest volume of business was performed at the corner sites, their gains were only slightly higher than the increased returns made by the smaller businesses having inside locations.

Volume of Business

A classification has been made of the volume of business performed by each retail outlet along 16th Street in order to show the representation of business by size. Of the 144 retail outlets reporting their gross business volume for sales tax purposes, 91 were in business during the entire or the majority of the time covered by this economic study. The other 53 reported such fragmentary returns that it was not possible to classify them according to their annual gross returns; therefore, they were not included in this phase of the study. Forty of the 91 retail outlets in the study were small business establishments having annual gross receipts under $50,000. Thirty-one retail outlets had annual receipts between $50,000 and $200,000 and the remaining 20 outlets in this study had annual gross receipts of $200,000 or more. These statistics show that 44 percent of the retail outlets on 16th Street would be classed as small businesses.

New Business

Further information of interest with respect to the retail phase of this economic study deals with the changes made in business operations along 16th Street. During the year of two-way traffic, there were seven new businesses started, whereas 11 new businesses started in the year of one-way traffic. During each single year of the study there were three retail outlets which closed without a succeeding successor.

Accidents and Traffic

The volume of traffic on 16th Street decreased from 14.49 to 13.60 million vehicle miles (MVM) during the last 10 months of the one-way phase of this study as compared with the last 10 months of the two-way phase. A 10-month study period was used on traffic volume rather than the full year because this phase of the study was restricted to the actual days when traffic was either one-way or two-way. Converting the traffic volume into vehicle use per day, the facts show there were 20,945 vehicles using 16th Street during the two-way system as compared with 19,672 vehicles using the street when it became one way.

Accidents Decrease

Vehicle accidents on 16th Street decreased 16.36 percent during the one-way period of the study as compared with the previous two-way traffic sys-

. . . Continued on page 29

Tracy Expressway

Realignment of U. S. 50 in Alameda-San Joaquin Counties

By W. F. FLEHARTY, Assistant District Construction Engineer

Construction now is well under way on the seven and one-half mile grading project on U. S. 50, beginning at the eastern end of the Altamont four-lane highway constructed in 1937 and ending at Corral Hollow Road which is located approximately one-half of a mile west of the present crossing of U. S. 50 and the Southern Pacific Railroad tracks near the west city limits of Tracy. Portland cement concrete paving and a temporary connection to the present highway near the west city limits of Tracy will be completed as a separate project scheduled to start in 1954. A further project is contemplated for an interchange and railroad separation structure at the west city limits.

This project is all on new alignment lying approximately one and one-quarter miles south of the existing highway. Upon completion the new routing will save the traffic traveling between Tracy and the East Bay area points approximately nine-tenths of a mile of distance over an inadequate two-lane highway with insufficient shoulder widths and with approximately one-third of the distance through the foothills on a rolling, no-passing grade with several horizontal curves.

Present Route Congested

Approximately 10,000 vehicles per day are using the existing two-lane highway at the present time. Vehicular traffic is estimated to increase to 16,500 vehicles per day by 1970. This number of vehicles, of which approximately 15 percent is trucks, are operating over the existing highway which is necessarily badly congested, especially for the westbound traffic on the upgrade in Alameda County.

The new facility will eliminate this congestion and with the nine-tenths of a mile shorter distance will result in a considerable savings in traveling time, distance and cost to the motoring public as well as a reduction in vehicle accidents.

Rights of way have been acquired on a full freeway basis with all access to private property being acquired and eliminating access to and across the highway at grade except at Patterson Pass, Hansen and Lammers Roads. One and one-third miles of existing county road on the eastern end of the project will be utilized as a frontage road to serve the local traffic.

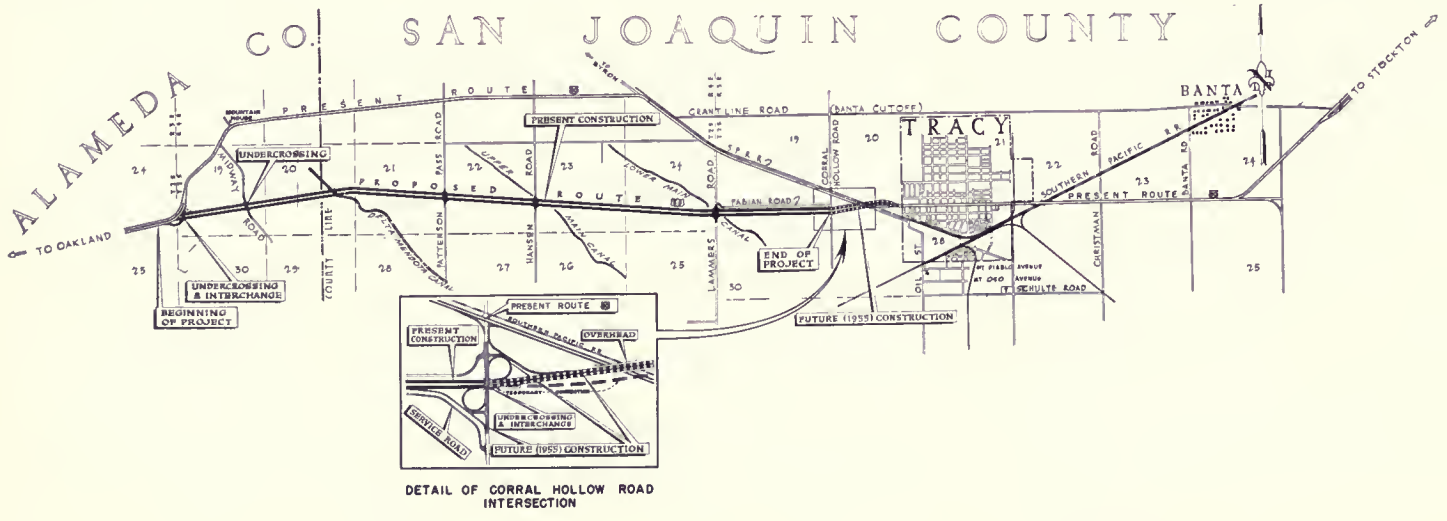
The major work consists of constructing three underpass structures beneath the new four-lane highway, twin bridges over the Delta-Mendota Canal, the usual irrigation and drainage structures and grading of the four-lane expressway with sufficient base material for the subsequent paving contract, all at an estimated cost of $1,558,400. This project should be completed about July 1, 1954, followed by the paving project which should be completed in 1955. The third contract for the interchange and railroad separation will follow.

Mountain House Underpass

Traffic bound for Mountain House via the existing highway will be carried under the new expressway by the construction of a three-span open and reinforced concrete slab bridge 137 feet 9¼ inches long and 79½ feet wide carrying two 35-foot roadways with a four-foot division curb. Foundation pile work has been started on this structure.

Midway Road Underpass

Midway Road traffic will be carried under the expressway by the construction of two reinforced concrete slab bridges of three spans each with open ends; both structures will be 102 feet 6½ inches long with a 28-foot roadway between the curbs. Embankment work in the vicinity of this structure







UPPER—Midway Road fill showing heavy equipment. LOWER—Mountain House Underpass off ramp construction. Rock crusher in foreground.

is being rushed to allow an early start on constructing this structure.

Delta-Mendata Bridges

The highway traffic will cross the Delta-Mendota Canal over two reinforced concrete girder bridges, each having three spans for a total length of 156 feet 5 inches and a width of 28 feet between the curbs.

An unusual water condition develops at this location as this canal is used all summer to carry irrigation water back up the San Joaquin Valley, thus making the dry canal season fall during the winter months. The tentative schedule obtained from the U. S. Bureau of Reclamation prior to starting this project was for no pumping operations during the period November 1, 1952, to January 31, 1953, with the exception of short test runs involving one pump. The actual pumping schedule was, no pumping during the period November 26, 1952, to February 13, 1953. There were no test runs during this period. This allowed ample time to cut through the four-inch concrete canal lining, excavate the footings, form and pour the concrete footings and bents without having to work under water. This same four-inch concrete canal lining was utilized as footings for the false work with a maximum allowable load of 25 pounds per square inch.

Construction of these structures was further aided by their accessibility over the existing gravel road along the east canal bank and the timber bridge across the canal near the bridge site.

Delta-Mendata Canal Maintenance Underpass

The original plan for handling Delta-Mendota Canal maintenance traffic was changed by amended contract to construct at a cost of $50,000 a reinforced concrete box underpass 12 feet wide and 14 feet high with graded roadway connections to the



View showing construction of Delta-Mendota Bridge, unit of Tracy Expressway

existing road along the east bank of the canal. This will eliminate any possibility of conflicting traffic and the potential accident hazard.

Irrigation Facilities

As the San Joaquin County portion of this project traverses the Westside Irrigation District a concentrated effort had to be made during the winter season to have all irrigation crossing structures completed prior to the start of the 1953 irrigation season. Due to the lack of rainfall during January and February of this year the irrigation season started February 20, 1953, approximately six weeks earlier than normal.

Earthwork

Some 637,000 cubic yards of the 877,000 cubic yards in the roadway cuts will be utilized to construct the road embankments and will involve 21,700,000 station yards of overhaul. The remaining 240,000 cubic yards of material from the westerly end of the project will be crushed for sub-base and base materials.

The 1.7 miles located in Alameda County and the first one-quarter mile in San Joaquin County are located through rolling foothill country resulting in heavy cut and embankment sections with relatively short haul distances. The soils throughout this area are composed of materials ranging from adobe topsoil and hardpans to sandstone in the deeper cut sections; these variable materials in conjunction with short hauls created quite a compaction problem. The final combination of compacting equipment consisted of a large sheepsfoot tamper towed by a large tractor and a 50-ton four-wheeled pneumatic super compactor also towed behind a large tractor.

The material from the westerly end of the project that is to be crushed is composed of sandstone, conglomerate and semicemented gravel mixture and is to be crushed by a unitized plant consisting of a 32 x 40-inch primary jaw crusher, an 18 x 36-inch intermediate jaw crusher and a 40 x 24-inch secondary roll crusher. It will be necessary to maintain a production of 2,400 tons per day to complete this project within the contract time limit.

Work is now under way preparatory to setting up this crushing equipment and drilling the rock cut for blasting operations. The sandstone formation has broken up in chunks too large for even the oversize crushing equipment. Subsequent changes have resulted in breaking this material down to smaller particles which should better fit the crushing equipment. All conditions considered, this quarrying and crushing operation poses a very interesting problem.

This project is being constructed as a joint venture by McCammon-Wunderlich Company and C. K. Moseman. Moseman is constructing the major structures and the McCammon-Wunderlich Company is performing the balance of the work.

E. L. Craun is the Resident Engineer for the Division of Highways on this project.

RIGHT-OF-WAY ECONOMICS

ASSOCIATION OF WASHINGTON CITIES
Seattle 5, Washington

Mr. Kenneth C. Adams, *Editor*

Dear Mr. Adams: We have come, recently, to find the contents of your publication most valuable to the cities of this State in reference to the economics of right-of-way acquisition.

It is our understanding that this office can be placed on your mailing list and receive this publication regularly. We shall appreciate having our name added to your mailing list.

Sincerely,

Floyd M. Jennings
Planning Consultant

One-way Street

Continued from page 25 . . .

tem. The difference in traffic volume has been taken into consideration in arriving at the percentage decrease in vehicle accidents. Using the same method of adjusting the volume of traffic of the two comparative periods, the statistics show that during the one-way traffic period of this study, pedestrian accidents decreased 22.03 percent.

These figures are noteworthy in view of the fact that vehicle registration, the volume of traffic and the number of vehicle and pedestrian accidents are steadily increasing on all major streets and highways throughout the State.

Property Values Firm

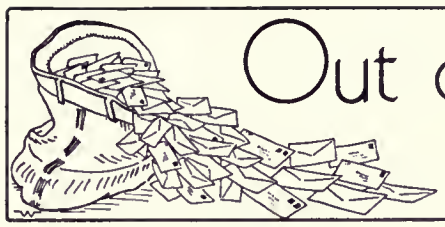
An investigation of all recorded property sales on 16th Street from 1948 to 1953 reveals that 24 individual properties sold at least once during those five years and seven of these parcels resold within that period of time. During the two-year period covered by this economic study, 13 of the 24 properties were sold; eight parcels transferred in the first year of the study when traffic on 16th Street was two-way and five parcels sold during the second year when traffic was one-way. The selling price of properties on 16th Street was compared with the sales of property having similar characteristics and located on two-way streets in the immediate area.

The results of this phase of the study definitely show that real property having frontage on 16th Street has followed the same general price trend as comparable property fronting on two-way streets in this section of the city.

Conclusion

One-way streets are increasing in popularity as an effective interim method of relieving traffic congestion on city streets pending the time when the traffic count is such that it justifies complete separation by a freeway or similar type facility. Principle factors contributing to this popularity are: (1) substantial reduction in vehicle and pedestrian accidents; (2) increased traffic-carrying capacity on one-way streets; (3) relatively inexpensive cost of converting streets from two-way to one-way traffic. These factors alone have justified the change to one-way streets.

One of the remaining obstacles to the general acceptance of one-way street principle has been the belief of local businessmen that the conversion to this principle was detrimental to their business. This study has produced sufficient facts so that we feel it should remove this last major objection to their general acceptance.



Out of the Mail Bag

FROM PHILIPPINES

MC LIBRARY, MINDANAO COLLEGES
Davoo City, Philippines

Department of Public Works
Division of Highways
California, U. S. A.

SIR: We learned from the Monthly Checklist of State Publications, Volume 43, No. 5, May, 1952, that you furnish on request some of your published materials.

In this connection we would like to request that we be supplied a copy of your *California Highways and Public Works*, Volume 31, No. 1-2. This material will be of great help to our students particularly in their studies and their research work.

Whatever help or favor you may extend to us will be highly appreciated.

Very respectfully,

SOTERO L. PALABYAB
Librarian

THANKS FOR COMPLIMENT

California Highways and Public Works
Sacramento, California

GENTLEMEN: I have received your valued publication for a number of years and enjoy every bit of the information regarding our highway system. I would not want to miss a single issue, and desire at this time to compliment your staff on a splendid job. Please change my address on your mailing list as shown below.

Yours very truly,

ARTHUR H. ZIEGLER
Sacramento, California

ENGINEER WANTS MAGAZINE

Berkeley 4, California

California Highways and Public Works
Sacramento, California

GENTLEMEN: From time to time when I have been lucky enough to obtain a copy of your *California Highways and Public Works* magazine, a wealth of information has been obtained regarding proposed, current and completed construction projects. As a taxpayer and a motorist, whose appreciation of improved roadways is always felt, it is of importance to know firsthand of the facts governing the future highway projects. To be well informed on these matters makes not only for general interest, but is a vital necessity since the work on this phase of transportation will affect us all in the future.

I would appreciate being placed on your mailing list for this fine publication. My connection is with the Pacific Gas and Electric Company in San Francisco as an electrical engineer.

Very truly yours,

ERIK A. JACOBSON

MAGAZINE INFORMATIVE

CARL A. SCHULTZ
Licensed Real Estate Broker
Los Angeles

California Highways and Public Works
Sacramento, California

GENTLEMEN: We have for several years been recipients of the magazine, *California Highways and Public Works* and not only enjoy its contents but consider that it is most informative and part of our general education as citizens of the State of California.

CARL A. SHULTZ

Antioch Bridge

Repairs on Old Span Have Removed Traffic Hazards

By O. M. UHL, Associate Bridge Engineer

THE REINFORCED concrete trestle forming the north approach to the San Joaquin River Bridge on State Sign Route 24 was repaired under contract during the latter part of 1952. These repairs were necessary to make the trestle safe for all combinations of legal loads until construction of a new approach on an improved alignment is completed. The proposed approach structure is currently budgeted for construction to begin in 1953.

The San Joaquin River Bridge near Antioch was constructed by the American Toll Bridge Company in 1926. It was operated as a toll bridge until September, 1940, when it was purchased by the State and made toll free.

Sharp Horizontal Curve

The north approach trestle consists of a series of reinforced concrete girder spans supported on fur-column tower bents, with open expansion joints in the deck over each tower bent. The bents are founded on timber piles. The sharp horizontal curve, irregular profile and lateral shifting owing to settlement of this trestle have been the subject of increasing concern to the Division of Highways during recent years.

The end bent of the trestle is near the location of the old loading slip of the ferry which operated on the river prior to 1926. The horizontal curve in the trestle was designed to align it with the levee road which ran to the ferry slip. Consequently, the trestle parallels the river levee over a considerable portion of its length. The levee is approximately 18 feet above the plane of the island at this location, and this overburden on the underlying soft material is believed to have contributed largely to the lateral shifting of the trestle. Accompanying photos show the trestle looking west long the levee road. The improvement in both vertical and horizontal alignment brought about by this repair work are readily visible.

Periodic Surveys

Periodic surveys of the trestle have been made since 1940. The survey of March, 1952, indicated pile settlement of as much as 2.4 feet at the northerly end bent. Settlements of one foot or more have occurred at the columns of several other bents in the northerly spans. Lateral shifting of as much as one foot, and longitudinal displacements of six inches at three of the deck expansion joints have also occurred.

A major repair contract was awarded in October, 1952, to strengthen the structure, repair critical deterioration, and relieve critical stresses induced by unequal settlement in six spans adjacent to the northerly end bent. The contract involved the construction of supplemental bents and timber cribs at six contiguous bents at the north end of the trestle, jacking of six end spans to an improved profile, and strengthening of columns weakened by deterioration and racking.

Structural steel beams and H-pile sections were furnished to the contractor by the State.

Tower Bents Installed

Tower bents consisting of six timber posts and double steel caps were installed at two existing tower bents. Timber cribs were constructed at five additional bents. With one exception, the cribs and supplemental bents are founded on reinforced concrete pedestals. A lens of saturated peat was encountered at one of the north pedestals on the lower side of the levee. A layer of sand backfill was placed on the exposed peat, and a timber mat, 10 feet x 12 feet in plan, was placed thereon. This revision produced a stable footing which did not settle when the load of the superstructure was transferred to it.

The purpose of the double steel caps was to provide jacking facilities and the installation of steel chairs after the existing columns had been severed and the bridge deck raised. Accompanying photos show the supplemental bents. Cribs were constructed where the height of the structure was not sufficient to provide adequate bracing for bents.

Hydraulic Jacks

The contract plans specified the use of hydraulic jacks. A total of four 100-ton jacks and eight 60-ton jacks were furnished by the contractor. The jacks were pretested, prior to jacking operations. Following are properties of the jacks:

Capacity	Diameter of ram, inches	Maximum rise, inches	Over-all height, inches
60 tons	5	8	15
100 tons	6½	12	20

The contractor also furnished four pressure gages which were used continuously during preloading and jacking operations to measure loads on the jacks. Fluid pressure used to raise the rams of the jacks, was provided by a central pump operated by compressed air. A specially reinforced rubber hose designed to withstand a maximum pressure of 6,500 pounds per square inch, was used for pressure lines.

Before the columns were severed, and prior to jacking operations, the supplemental bents and cribs were preloaded to test the bearing capacities of the new pedestals. The entire load of each span was transferred to the new pedestals during this operation. The foundations were adequate since settlements of only approximately one-half inch were observed.

Bridge Deck Raised

After the supplemental bents had been preloaded, the existing columns were severed adjacent to the existing column struts at the ground line. Next, the bridge deck was raised to an improved profile by means of the hydraulic jacks. The deck was raised a maximum of 10 inches during this operation. After the loads had been transferred from the jacks to temporary timber blocks, the severed



UPPER—Looking west along levee rood. General elevotion of north approach trestle looking west along top of levee. LOWER—Contra Costa County, Route 11, Antioch Bridge, roodway view looking west.

columns were recast, using 2 percent calcium chloride to hasten set of the cement. Finally, steel chairs fabricated from H-pile sections were inserted and welded in place between the steel caps of the supplemental bents. The steel chairs transfer a portion of the span loads to the supplemental bents and decrease the loads on the existing columns and timber piles. Extra steel wedges were furnished by the contractor for future use in case settlement of the supplemental bents occurs. The wedges can be inserted between the upper steel caps and steel chairs.

Columns Reinforced

A total of 10 existing columns were reinforced with 10-inch steel H-pile sections. These columns had developed critical strains and required strengthening. Some columns had settled only slight amounts and it was not necessary to sever and raise them to obtain stress relief. These are located at various bents south of the six end spans. Double steel wedges were inserted at the bottoms of the steel H-sections and grout pads placed at their tops to bring these supplemental supports into bearing. Steel brackets on the sides of the steel columns were provided for jacking so the steel would take a share of the load. Their use assured full bearing of steel columns at top and bottom.



UPPER—Tower bent 98-99 SW. View of supplemental bent looking toword top of levee. LOWER—View of supplemental bent showing double steel caps and diagonol brocing systems.

In the past as the structure settled, bituminous surfacing was added to the deck to eliminate offsets at the joints. It was necessary to remove portions of this surfacing during jacking operations to obtain an improved riding deck. Except during the removal of surfacing and jacking operations, the work was accomplished with no traffic delay. One-way traffic was maintained during these periods.

Traffic Hazards Removed

As a result of these repairs, the hazards to traffic as developed by past settlement have been removed. The structure has been given temporary additional supports which should be adequate until the new approach can be built later this year.

The prime contract was awarded to Stanley H. Koller Construction of Crockett, California. Bender and Beale of Richmond, California, held a subcontract for steel erection. Forty-four working days were required to complete the contract.

The design and construction were performed under the direction of F. W. Panhorst, Assistant State Highway Engineer. George W. Smith, of the Bridge Department, designed the structural elements and devised the method of transferring the loads to the supplemental bents. The author was resident engineering during construction.





UPPER—Timber crib for supplemental support of existing column. LOWER—View of hydraulic jack, pump and accessories.

HIGHWAY HYPNOSIS

Purposely vary your speed, not every minute or two, but perhaps every quarter of an hour to avoid falling victim to a driving experience known as "highway hypnosis." This insidious condition, warns the California State Automobile Association, can overcome the driver traveling a steady speed over straight road for a long time and accounts for many rear-end collisions on today's highways.

Storm Damage

Loss on State Highways in Northern Counties $1,500,000

By E. L. MILLER, Supervising Highway Engineer

DAMAGE to state highways in the north coastal counties of California, estimated at about $1,500,000, occurred as the result of a Pacific storm of severe intensity during the week-end of January 16th to 18th, inclusive, which extended from the Van Duzen River, south of Eureka, to the Oregon state line.

The impact of the storm severed state highway facilities in numerous places and disrupted normal traffic for a week or more. The damage resulting from the heavy rainfall and high river and stream stages affected in some measure the entire populace of coastal region north of Eureka. Flooding of the towns of Orick and Klamath, as well as the extensive damage to the entire transportation systems in northern Humboldt and Del Norte Counties, led to the declaration by Governor Warren of a state of emergency within the area.

Heavy Rainfall

In severity this storm was comparable to the storms of 1927, 1937, and 1950, which also resulted in heavy damage in the north coastal regions. In several locations the high-water stages and attending damage exceeded that of these previous storms. Some idea of the intensity of rainfall may be obtained from the following tabulated rainfall for the storm period.

Rainfall for Storm of January, 1953
By Inches

	Date			Total rainfall for storm
	16th	17th	18th	
Cresent City	2.00	6.68	4.74	13.42
Orleans	1.22	4.20	3.57	8.99
Prairie Creek	2.00	4.88	5.19	12.07
Redwood Creek	1.71	6.20	7.00	14.91
Eureka	0.92	3.70	1.84	6.46
Scotia	0.00	0.94	3.21	4.15

An examination of these data reveals that the highest recorded 24-hour intensity of seven inches was recorded at Redwood Creek which also recorded the highest total of 14.91 inches for the storm and that the area north of Eureka experienced the heavier rainfall, all stations recording nine inches of rainfall or over for the week end.

This storm followed in the wake of several weeks of intermittent light to heavy rainfall which had thoroughly soaked the countryside and kept the rivers and streams at a moderate stage. The resulting runoff swelled all streams north of Eureka to flood proportions. At Orick, high water in Redwood Creek exceeded by 10 inches all other high waters recorded at that location and flooded the town of Orick to depths of from two to four feet, causing extensive property damage as well as damage to highways and bridges.

Flood Stage on Mad River

Flood stage of Mad River measured at the bridge north of Arcata was the highest since the structure was built in 1929 and resulted in flooding of the lowlands and damage to several small highway bridges and approaches.

High water in the Klamath River was the highest in 18 years and, although records are incomplete, it is the general opinion that the flood stage was equal to or even exceeded that of the 1927 storm. The town of Klamath was flooded to a depth of from three to four feet, the first time since 1927, and a number of dwellings at Klamath Glen were destroyed by high water.

Smith River reached a flood stage of within 1.5 feet of the 1950 level, but, fortunately, the resulting highway damage, though severe at several locations, did not reach the proportions of the 1950 storm.

Debris Causes Damage

High water alone was not accountable for all the damage suffered by the highways in this area. An extreme debris condition existed at the time of the storm as a result of slashings left by logging operations. The debris-laden streams plugged numerous drainage structures, resulting in the loss or partial loss of roadway and damage to structures at many locations. During the height of the storm, efforts of the maintenance crews were primarily directed toward removing debris to preserve drainage.

The Redwood Highway between Eureka and Crescent City was closed for several days due to flooding and washouts. Emergency repairs made by maintenance forces with state-owned and rented equipment permitted opening the road to light traffic on January 23d, and to all traffic the following day. Slipouts, washouts, slides, and bank erosion were prevalent throughout the section.

Serious Washout

The most serious washout occurred about 20 miles north of Eureka where plugged drainage resulted in the complete loss of a large sidehill embankment. To complicate emergency repairs, a slide occurred at the same location where state forces and rented bulldozers had to cut into the hillside to construct a detour around the washout. A similar washout near the Humboldt-Del Norte County line closed the road to all traffic until a temporary detour could be constructed. From Crescent City to the Oregon state line the damage was confined to several locations where high water scoured the banks and partially destroyed existing bank protection. The damage, though severe, did not cause any serious delay to traffic.

The Roosevelt Highway from Crescent City to the Oregon state line was closed due to a partially destroyed bridge at Jordan Creek, about four miles north of Crescent City and a washed out bridge at Gilbert Creek, about one mile south of the Oregon state line. Emergency repairs were made at Jordan Creek, and state forces, cooperating with Del Norte County, repaired and improved a county road detour around Gilbert Creek, permitting travel to resume on January 23d.





UPPER — Temporary detour under construction around washed out embankment 20 miles narth of Eureka on Redwood Highway. LOWER—Washed out roadway an Redwood Highway seven miles north of Trinidad.

Both of the above bridges will have to be replaced with new structures.

Arcata-Redding Lateral

Damage to the Arcata-Redding lateral, U. S. Route 299, consisted of numerous slides and slipouts of varying size, plugged drainage structures, washed out embankments, and a washout of the west approach and damage to the abutment of the Weaver Creek bridge near Weaverville. The most serious damage occurred about five miles east of Blue Lake where a 15,000 cubic yard embankment was completely destroyed when a culvert became plugged. Fortunately, it was possible to detour traffic around the washout on a remaining portion of the old road after making some repairs. Two other sections of roadway near Willow Creek were completely destroyed due to plugging of drainage structures by debris-laden streams. Several days were required before traffic was able to proceed as far as Willow Creek and the route was opened throughout on January 26th.



Fifteen hundred cubic yards of embankment washed out five miles east of Blue Lake on Arcata to Redding lateral, U. S. 299



Washed out bridge at Gilbert Creek two miles south of Oregon state line on Roosevelt Highway

Klamath River Lateral

The Klamath River lateral was damaged even more severely. A large slide and several slipouts closed the road between Klamath and Klamath Glen. Between Martins Ferry and U. S. Route 99 plugged drainage and heavy runoff resulted in many washed out embankments, slides, and slipouts. The most serious slipout some 400 feet in length occurred at Ulathorne Creek near Orleans. Several days were required before it was possible to open this section to emergency traffic.

Two major structures received serious damage, and a number of smaller bridges were damaged to some degree. The westerly pier of the steel span at Bluff Creek was undermined and settled about two feet as well as being displaced horizontally. One abutment and span of the Seiad Creek bridge was destroyed. Temporary repairs have now been made so that travel has been resumed.

State Sign Route 36 between Alton and Bridgeville also was damaged though not as extensively as the northerly laterals.

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West Sacramento Freeway *Will Be Completed Late In Fall of This Year*

By R. E. STICKEL, District Office Engineer

In another year an important link in an ultimate freeway between the Bay area and California's capital city will be completed. This link, comprising the so-called "West Sacramento Freeway," in Yolo County extends from the Yolo Causeway to the Tower Bridge across the Sacramento River, a distance of approximately four miles.

Deficiencies in the present route, U. S. 40, became apparent nearly a decade ago, when insufficient traffic lanes and lack of control of access began to restrict the orderly flow of traffic. It was realized that normal increases in traffic volume and expanded ribbon commercial development would accentuate the deficiencies.

The frontage between the Yolo Causeway and the Tower Bridge was more than 50 percent commercial, including motor courts, large truck filling stations, an open air theater, markets, and several industrial establishments. The area behind the frontage was subdivided for the most part and had begun to support considerable urban development. Widening of the Washington Underpass, near the Tower Bridge, and improving approaches thereto presented an im-

From top to bottom structures on freeway are as follows: West Acres-Boulevard Undercrossing, Routes 6-99 separation structures, Davis Highway Ramp Overcrossing, West Sacramento Underpass, State Box and Third Street Undercrossing and west end of Tower Bridge. The Washington Underpass is shown on the old Davis Highway opposite the West Sacramento Underpass.





From top to bottom structures are as follows: Tower Bridge, West Sacramento Underpass and Davis Highway Ramp Overcrossing

mediate necessity if sufficient traffic lanes were to be provided.

Entire Relocation

An entire relocation of this section of highway proved advisable. The route adopted by the Highway Commission lies south of the existing suburban development; it traverses agricultural land, except for a moderately developed industrial area adjacent to the Tower Bridge. Right of way costs were minimized on this location.

In design provision was made for a tangent alignment at the Yolo Causeway to provide for future connection to a widened causeway. At the intersection of the freeway with Route 99 provision was made for connection to future highway facilities entering Sacramento south of the Tower Bridge.

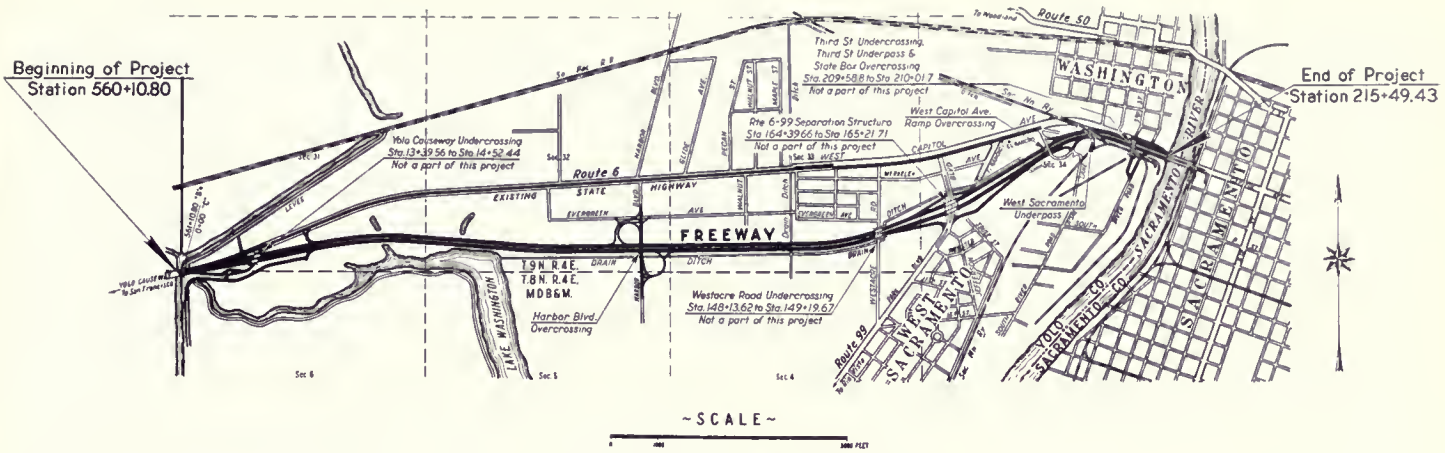
Access is, of course, controlled; and traffic will be permitted to leave and enter the freeway only at the Yolo Causeway, at Harbor Boulevard, at Route 6-99 Interchange, and at the Tower Bridge, where complete interchanges with grade separations will be provided.

This freeway, which will carry average daily traffic in excess of 24,000 vehicles per day, will cost more than $3,400,000. Limited funds, combined with high construction costs, made a program of stage construction mandatory.

Railroad Realigned

Provision for realignment at the Sacramento Northern Railroad occasioned construction of structures designated as the West Sacramento Underpass and the Third Street Underpass near the Tower Bridge. Grading for the railroad roadbed was accomplished under state contract. The placing of ballast and laying of track was accomplished by railroad forces.

A complex structure was required at Third Street, where the freeway,



Net Length of Project 21,185.30 feet - 4.012 miles

From top to bottom structures are as follows: Tower Bridge, West Sacramento Underpass, Davis Highway Ramp Overcrossings and Routes 6-99 separation structures





From top to bottom structures are as follows: Tower Bridge, West Sacramento Underpass and Davis Highway Ramp Overcrossing

the Sacramento Northern Railroad, and an access road to the State Box Company passes over Third Street. The southerly portion of this structure, consisting of the Third Street Underpass and the State Box Overcrossing, was constructed under one contract and the remainder is being constructed under a second contract.

Over 500,000 cubic yards of imported borrow were placed on the major grading contract. A large portion of this was obtained from the proposed deep water channel of the Sacramento-Yolo Port District, about 1¼ miles south of the Yolo Causeway Undercrossing. Provision was made on the

. . . Continued on page 59

Project Contracts

Description of contract	Contractor	Approx. cost	Acceptance date
Grade and pave on Merkley Ave.	Brighton Sand & Gravel	$10,000	April 4, 1951
Construct two separation structures: Rt. 6-99 separation (EB & WB); grade and pave minor artery at interchange	MacClosky & Harms	249,000	August 30, 1951
Construct two separation structures (EB & WB) Yolo Causeway undercrossing	MacClosky & Harms	97,000	November 14, 1951
Construct two separation structures: Westacre Rd. (EB & WB); grade and pave minor artery	MacClosky & Harms	88,000	January 11, 1952
Grade railroad roadbed	Brighton Sand & Gravel	23,000	April 1, 1952
Construct four separation structures: West Capital Ave. ramp overcrossing, West Sacramento underpass, Third St. underpass, and State Box overcrossing	A. Teichert & Son	401,000	May 20, 1952
Grading Yolo Causeway to 0.8 mile west of Tower Bridge	United Concrete Pipe	621,000	November 14, 1952
Grading 0.8 mile west to 0.1 mile west of Tower Bridge	Ukropina-Polich-Kral	190,000	Underway
Construct structure and grade approaches at Third St. undercrossing	Ukropina-Polich-Kral	77,000	Underway

Traffic Paint

Its Development in California Makes an Interesting Story

By E. D. BOTTS, Senior Chemical Testing Engineer

CALIFORNIA'S traffic paint program—the development and placing of that broken white line which guides you along the highway—is maintained at an annual cost of approximately $700,000. The evolution of that line from city crosswalk delineation through the solid line of the highway to the reflectorized broken line of today is probably familiar to most motorists. The technology and compositional factors associated with the development are not so well known, although many of our highway personnel are aware of California's pioneering in the field. They will remember also the introduction of the "California Formula" which was developed by the late G. H. P. Lichthardt of the Materials and Research Department of the Division of Highways.

California Formula

This "California Formula" was used successfully in California for many years and had widespread use in several other states for a time. It encountered disfavor in the East in later years, partly because of the inconvenience experienced in its manufacture and partly because of its limited durability in those areas. In California, however, it gave good service on asphaltic pavements as recently as 1951. Except for the emergence of national shortages which forced us into other formulations, we would perhaps still be using this formula, though its relatively slow drying properties would render it very annoying under present day traffic volume. The temporary shortages made necessary some make-shift substitutions for the emergency, then a program designed to stabilize and improve our position in this field was begun. Perhaps one should say the program was intensified rather than begun, for experimentation has been in progress continuously since the adoption of the traffic line as a fixed part of the highway program.

Abrasion Apparatus

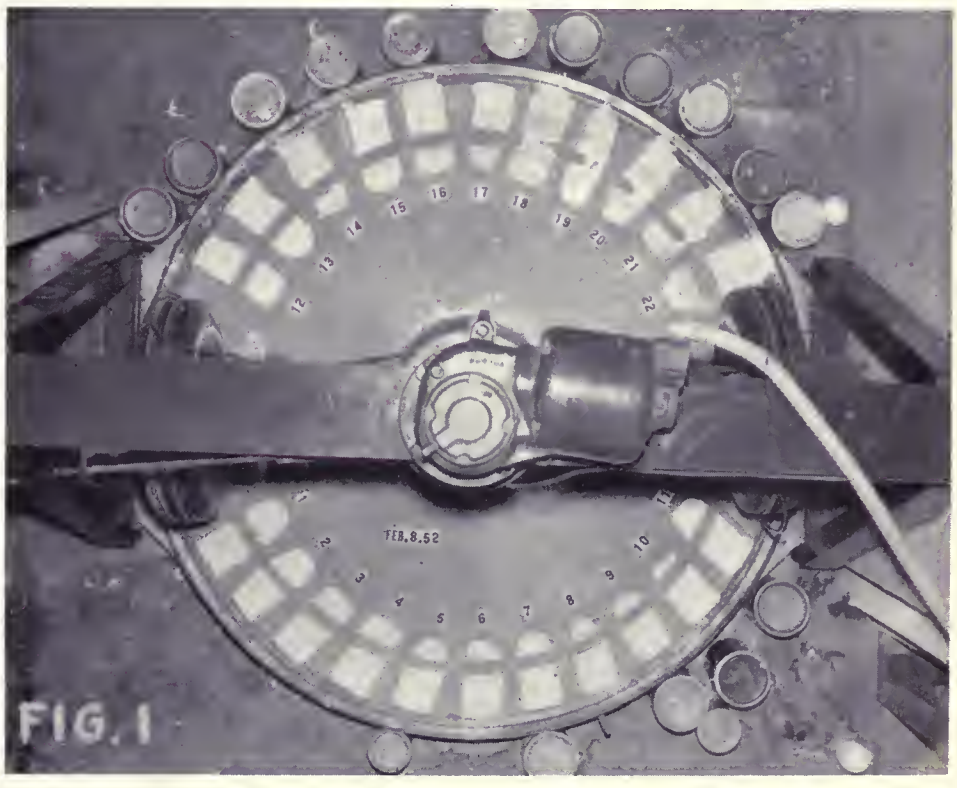
Preliminary experimentation with a large number of formulations on transverse traffic lines led to the selection of a few of them for large scale trial. An abrasion apparatus based on a design developed by the Los Angeles City Bureau of Standards was used as an accessory in some of this work. This apparatus consists of a three-quarter-inch plate glass, four feet in diameter, which acts as a track for anchorage of traffic stripes. The stripes .015 inch thick when wet, are drawn with a doctor blade and allowed to cure for a minimum of 72 hours. Weighted rubber-tired wheels set at a 2-degree bias are then driven over the lines in a dry condition for a definite number of passes. A similar treatment is then applied to the lines under wet conditions.

Figure 1 shows the results of a typical test of this kind on the apparatus in use in the Materials and Research Department. In this instance the apparatus was run until virtually all samples failed. It would be superfluous to identify each of the lines and its composition in an article of this kind.

Results of Tests

It should be pointed out, however, that the correlation of such tests with practical service tests is not as good as was hoped for. The test is exclusively a measure of the resistance of a film to abrasion. The lack of correlation between tests on this apparatus and those on a highway is not due to

Apparatus used to compare the abrasion resistance of paint films



improper comparative measurement of abrasion but rather to the fact that many other factors are involved in making a satisfactory traffic line. Highway pavements are of concrete or asphaltic mixtures and there is no complete correlation between transverse line performance tests on the highway if the tests are widely separated with respect to location or time of application. Indeed there is no complete correlation of the performance of the traffic lines throughout the State even under comparable traffic conditions. The laboratory tests do give valuable information however, and point the way for establishing large scale tests, which, after all, are the real criteria by which we must be guided, both as to feasibility of manufacture and use.

Bids on Five Types of Paint

Following this premise (that large-scale tests under service conditions provide the best criteria for traffic stripe performance), we issued invitations for bids in 1950 on five differ-





These two photos show California Type II (Alkyd) pavement marking near an intersection after seven months of service. UPPER—Lodi on U. S. 99; LOWER —On Stockton By-pass, U. S. 99.



ent vehicular types of traffic paint. These types were:

I—The D. B. B. Manila resin and chinawood oil—the "California Formula."
II—Alkyd.
III—Dispersion resin.
IV—Chinawood oil—pentalyn varnish—chlorinated rubber.
V—Modified phenolic resin, castor oil, chlorinated rubber.

The pigmentation was left to the discretion of the manufacturer with the proviso that covering capacity should be 200 square feet per gallon as a minimum.

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UPPER—Single line in foreground is California's Experimental Type III in background. On U. S. 50 section change just east of Folsom. LOWER—California Standard Type IV traffic stripe after eight months' service.



Retirements *from* Service

WILLIAM J. GOUGH

Widely-known and respected, Wm. J. (Major) Gough of the Equipment Department, Division of Highways, retired February 28, 1953.

Mr. Gough is one of the oldest of the Equipment Department employees, having been with that department since its inception.



WILLIAM J. GOUGH

He was born on February 20, 1883, in historic old Leonardstown, St. Mary's County, Maryland. He attended Baltimore Polytechnic College and Johns Hopkins University receiving his degree in civil engineering in 1903.

For several years he followed his profession with the Louisville and Nashville Railroad and on Mexican, Central American and Chilean railroad construction projects. In 1911 he came west to visit a sister in Los Angeles, and while there he was invited to also visit San Diego. His first trip west convinced him that California, and San Diego in particular, was the place for which he had been searching.

Almost immediately after his arrival there he met and married Margaret Mannix and seriously settled down to the business of making a home. Their two children, William, Jr., and Margaret, were born there.

Served in World War I

During the next few years he was employed as civil engineer by the Babcock interests and the Spreckels Development Co., taking a part in the great expansion that took place in that area prior to the first World War. His remarkable personality won for him many friends and acquaintances among some of the Nation's most prominent

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WILLIS F. JONES

Willis F. ("Bill") Jones retired from state service on March 1st after 25 years with the State Division of Highways as an Assistant Highway Engineer. Outside of a six-months' temporary assignment to District XI in San Diego, on military defense roads, his entire service was spent in District VIII in San Bernardino.



WILLIS F. JONES

Bill was educated in the public schools of Spokane, Washington. He started on his varied engineering career of 40 years in 1910 in British Columbia, as a chairman on a railroad location party for the Kettle Valley Railroad (a subsidiary of the Canadian Pacific Railroad), between Midway, B. C., and Hope, B. C. He was topographer on one of six parties for the Canadian Pacific Railroad on double-track location between Vancouver, B. C., and Calgary, Alberta; instrument man and resident engineer for the latter railroad on double-track construction out of Vancouver, B. C.; resident engineer on railroad construction for the Pacific Great Eastern Railroad between Squamish and Prince George, B. C., and assistant resident engineer on maintenance for the C. P. R. at Revelstoke, B. C.

In 1916, Bill returned to the United States as a resident engineer on an I. C. C. valuation survey for the Northern Pacific Railroad between Tacoma, Washington, and St. Paul, Minnesota. Then he engineered on power line location and construction for the Montana Power Company; was county engineer in eastern Washington for four years, and resident engi-

. . . Continued on page 45

JOSEPH S. LEMOS

Joseph S. Lemos, highway superintendent in charge of the Groveland area in Tuolumne County, retired on February 1, 1953, after 35 years of continuous service with the Division of Highways.



JOSEPH S. LEMOS

Lemos began his career with the State in 1917 at San Jose when he took a job as a truck driver with the California Highway Commission. In 1921, he transferred to the Ione territory as a mechanic.

This was in the days before asphalt surfacing and in order to control the dust, water wagons often were kept in operation day and night. Lemos' job was to keep the trucks in repair. He was also expected to take his turn at driving. During this period in his career he was transferred throughout the district with one order: Keep the equipment moving.

Many of the improvements and labor-saving devices which Lemos installed on the equipment during these and later years have become standard throughout the division.

In July, 1930, he was appointed highway foreman at Ione and in April, 1934, was advanced to superintendent with his headquarters at Crestview in Mono County, a post he held for six years.

In 1940 he was transferred to District X as a roving superintendent and during the next few months was assigned to various territories to take charge of resurfacing and general repair projects.

Lemos was appointed to his post at Groveland in January, 1941.

WILLIAM J. GOUGH

Continued from page 44 . . .

people who, like he himself, had succumbed to the charm of San Diego and its salubrious climate and had remained to make their home there.

World War I interrupted whatever plans he had for the future and in July, 1917, he entered the service of the U. S. Army. He was discharged in March, 1919, with the rank of Lt. Colonel.

Immediately following his discharge, he entered the service of the California Division of Highways as Assistant Highway Engineer, being selected by A. B. Fletcher, then State Highway Engineer, to prepare the foundations for the organization which later became the Equipment Department. He has served that department for 34 years.

Is Legionnaire

He has been an officer of, and was instrumental in the formation of one of the oldest American Legion posts in the West: Post No. 61, Sacramento. He is also a member of the American Society of Civil Engineers.

The "Major" as he is known by his fellow workers has, through the years, made an increasingly greater number of friends.

The Equipment Department is proud of Major Gough. He has not only won the profound respect of the men and women with whom he has worked so long, but their enduring and sincere affection. They wish him and Mrs. Gough many long and happy years of retirement.

WILLIS F. JONES

Continued from page 44 . . .

neer for the State of Idaho on highway location and construction for four years at Lewiston and Coeur D'Alene.

He came to California in 1925. After a year or so in charge of mapping the entire County of Riverside for the county assessor's records, Bill started with the State Division of Highways as a draftsman on February 8, 1928. He has served in various capacities in the division in both field and office.

During the stress of war conditions of the second world war and the rapid expansion of freeways to meet the State's highway needs, Bill was transferred to the District Right of Way Department where he finished his last eight years. As Right of Way Agent for two years, he assisted in right of way appraisals and acquisitions and wound up his service as District Right of Way Engineer, in charge of the engineering phases of right of way work including condemnation, exhibits, excess property, and record maps.

Bill has been active in C. S. E. A., having been the first temporary chairman in the San Bernardino chapter's organization and delegate to the first convention at Sacramento. Later, he was on the State Civil Service Committee and president of San Bernardino Chapter.

During his 25 years as a resident of San Bernardino, he has been active in civic affairs, having served as chapter president of the following organizations: County Horticultural Society, Speakers' Club, and American Association of Engineers, of which he is a senior member. He is also a member of the San Bernardino Mineralogical Society (rock hounds), and the Orange Belt Kennel Club. His hobbies are gardening and landscaping. He plans to enter the real estate business in San Bernardino.

P. RENWICK GREEN

With 40 years of service with the Division of Highways behind him, P. Renwick Green retired on January 31st as chief draftsman, Highway District III, headquarters Marysville.

Born in San Francisco and educated in the public schools of that city, Green in 1909 went to Tucson, Arizona, to work for the Southern Pacific Company. Upon his return to California he worked for the old Oakland-Antioch Railroad for a year and a half and then took a position with the Division of Highways in Willits, Mendocino County. He served there for 11 years, a period broken for one year in 1916 by lack of state appropriation. His next move was to headquarters in Sacramento. When District III office was moved from Sacramento to Marysville in 1933, he went along as chief draftsman and served continuously in that district until his retirement.

Mr. and Mrs. Green plan to travel and to spend considerable time during the summer months at their home near Sierra City.

STUDENTS USE MAGAZINE

UNIVERSITY OF CALIFORNIA
Institute of Transportation and
Traffic Engineering
Headquarters: Berkeley 4, California

March 9, 1953

Mr. Kenneth C. Adams, *Editor*

Dear Mr. Adams: As has been our custom during the past few years, I am submitting a list of names and addresses of students currently enrolled in the highway engineering course who we would like to see placed on the mailing list for *California Highways and Public Works.*

We are anxious to have the students read the magazine and to do all that we can to motivate the students in seeking a job with the Division of Highways after graduation.

Many of the students who have received the magazine have expressed their appreciation for this courtesy and have enjoyed reading the many fine articles in the magazine. I have found that each issue has two or three articles which I can assign for outside reading to supplement the regular course work.

Thanking you for this courtesy, I remain

Sincerely yours,

Ralph A. Moyer
Professor of Civil Engineering and Research Engineer
Institute of Transportation and Traffic Engineering

SOUTHWESTERN ARBORETUM

Southwestern Arboretum, located between Florence Junction and Superior on U. S. 60 in Arizona, is reported by the National Automobile Club to contain 10,000 varieties of plants from every continent.

Gas Tax to Cities

Review of Laws and Rulings Governing These Allocations

By L. V. CAMPBELL, Engineer of City and Cooperative Projects

This is the second installment of an article by Mr. Campbell.

Affecting Utilities

By that principle the construction of sanitary sewers, water mains, or other underground facilities are not permissible if the installation or replacement is being done to take advantage of the construction on the street. In general, any obstruction to the proposed improvement which requires removal or anything which is damaged or destroyed by reason of the new construction, may be removed, replaced, or restored to an equivalent condition to that which existed before construction, and the cost defrayed from gas tax funds. This, of course, does not include the removal of facilities that are in the street by franchise or permit which requires their removal and relocation at the utilities expense upon order of the city. Street railway franchises generally contain such a clause and public funds should not be used to relieve a private corporation of its just and legal obligations. Except as included in the restoration or replacement of existing facilities, gas tax funds may not be used for the construction of sanitary sewers, water supply lines, electrical conduits and other utilities.

Position of Department

The act requires that plans, specifications and estimate shall be approved by the department before the city may advertise for bids or proceed with construction work by day labor. In the review of plans and specifications there is no thought on the part of the department to assume a paternalistic or bureaucratic attitude. We fully recognize that many cities have well-organized engineering departments that are eminently qualified to design and construct pavements, bridges, and other structures. On the other hand, there may be cases perhaps where the department can be of real help. The district engineers and the entire department are ready and willing at all times to confer and discuss matters with cities. Plans and specifications are reviewed without any intention of being critical. Our only endeavor is to be helpful and constructive in any suggestions we may have to offer. The law puts the responsibility for the approval of plans upon the department. This responsibility is taken very seriously.

In the design of bridges and culverts, the department uses the standard specifications for highways, bridges, and incidental structures adopted by the American Association of State Highway Officials with slight modifications. State highway structures are designed for an H-20-S-16 loading except in the case of the most remote and lightest traffic laterals. An H-15 loading is the lightest loading that conforms to maximum legal loads permitted by the California Vehicle Act. In reviewing structural plans the department is guided by those design specifications. We cannot approve plans that in our opinion are structurally deficient or manifestly inadequate for the traffic. Where special conditions exist that would justify a lighter loading, we are willing to take such factors into consideration when making the review. When submitting plans for approval, cities are requested to include certain data including the live load used in the design for our information in making the review.

Safety Lighting

In order to differentiate between safety lighting and general street illumination, the department has adopted a criterion for safety lighting. Major city street funds may be expressed for safety lighting only when one or more of the following criteria are met:

1. That traffic signals are warranted. The warrants for traffic signals are as contained in the Manual on Uniform Traffic Control Devices for Streets and Highways, prepared by a joint committee of the A.A.S.H.O. Institute of Traffic Engineers and National Conference on Street and Highway Safety.

2. That there are five or more accidents a year and 50 percent or more occur under conditions other than daylight.

3. That, with less than five accidents per year at any one location, three or more accidents per year under conditions other than daylight may justify illumination.

When submitting plans and specifications for safety lighting, they should be accompanied by data showing that the proposed installation complies with one or more of the above criteria. The fact that traffic signals may be already in place at the intersection does not of itself satisfy criterion number one. Traffic signals may be installed with major city street funds without submitting data showing justification, and consequently even though the signals have been approved by the department they may not satisfy the warrants required in the Manual of Uniform Traffic Control Devices. It is therefore essential that when the traffic signal warrant is being used as a criterion for the installation of safety lighting, that data be submitted showing that traffic signals are warranted.

Specifications

The same comments apply to the review of specifications as to the review of plans. Many cities have standard specifications which have been approved by the city council as standards for city work. These specifications are used for work financed from the gas tax allocation as well as for other street improvements. Such practice is entirely satisfactory to the department. In such case it is suggested the city submit a copy of its standard specifications for approval by the department as a standard for use on gas tax projects; otherwise it is necessary that a copy of the city standard specifications accompany the special provisions and proposal form for each job. Other cities have not

adopted standard specifications, and in that case it is necessary to compile a complete specification for each job or to incorporate the state standard specifications by reference.

A sample form of special provisions has been prepared which may be used for street improvement or construction work financed from gas tax funds. The sample form incorporates the state standard specifications by reference. Use of the form is not compulsory. It was issued as a service to the cities. It will be noted in many cases in the state standard specifications reference is made to details that are to be included in the specal provisions. In using the state specifications care should be taken that all such items are included in the special provisions that are referred to in the standard specifications. In this connection attention is called to the requirement of including in the specifications the four general state laws applying to public works; namely, the alien labor, eight hours of labor, the prevailing wage, and the domestic materials or Buy American Act. There has been some difference of opinion in regard to the application of these general state laws to charter cities. I do not attempt to advise upon legal matters. I am merely repeating the advice of our attorneys. Furthermore, this matter has had a test in the courts. A decision of the State Supreme Court in the case of *Southern California Roads Company* v. *McGuire et al.*, No. S. F. 15215, P. 89 Cal. Dec. 5, upholds the prevailing wage law as applying to charter cities. Let me stress that the prevailing wage rates must be published in the advertisement.

Preliminary Estimates of Cost

There is not very much to say about preliminary estimates of cost. We are all of us human and are therefore liable to make mistakes. In these times of rapidly changing economic conditions preliminary estimates are quite likely to be wide of the mark. When you consider the large difference in the amount of the bids submitted by different contractors for the same job, I consider the correctness and consistency of the engineers' estimates to be remarkable. Those instances in which the engineer's estimate is materially under the low bid is certainly no reflection upon his ability as an engineer. The code contains a requirement that the written consent of the department must be secured before any contract may be awarded for an amount in excess of the estimates of cost, or to other than the low bidder on the grounds that the low bidder is not responsible, or before the work may be done by day labor. In these days of rapidly increasing prices it is not uncommon that the low bid received for a job is somewhat over the engineer's estimate. The department has a rule that when a city recommends the award of a contract at a price more than 10 percent in excess of the engineer's estimate, it shall be accompanied by a statement from the city engineer analyzing the difference between his estimate and the low bid. This analysis and other data presented will be submitted to the State Highway Engineer for his information in considering the award of the contract at the higher price.

Major City Streets

The code provides for a system of major city streets and that the city streets not included in the major city street system are designated as the city's secondary street system. It also requires the system of major city streets to be selected by the council on the basis of greatest general city importance subject to the approval of the department. Streets may from time to time be included in or excluded from the city system of major city streets subject to the approval in each case of the department.

There seems to be some confusion about the legal limitations on the mileage of major city streets. The mileage of major city streets in any city and county is limited by the act to 50 percent of its total street mileage. It will be recalled that the Collier-Burns Act limits the primary system of county roads to 50 percent of the total maintained mileage of county roads. San Francisco is the only municipality in the State organized as a combined city and county. San Francisco being a combined city and county receives both major city street funds and the county allocation of gas tax funds. There is no legal limitation on the mileage of major city streets in other cities. In one draft of the bill, however, the major city street system was limited to 25 percent of the total mileage of city streets. Due to the varying and multitudinous problems confronted by the different cities varying in size from a few hundred to nearly two million in population, I do not believe that a fixed limitation on major city street mileage would be feasible, neither would an explicit and precise definition of a major city street be practical. The act stipulates that they shall be of general city importance and I am satisfied that the city councils are sincere in complying with the law in making their selection.

Large System Opposed

There seems to be little point, however, in designating a large system of major city streets and the department is definitely opposed to an excessively large system. Under the original act the gas tax funds could be expended only on the then-called "streets of major importance." This limitation applied to maintenance expenditures as well as construction expenditures. The Collier-Burns Act liberalized this provision and permitted maintenance funds to be expended upon secondary city streets as well as upon major city streets and limited the expenditure to 40 percent of the annual revenue. Incidentally this 40 percent represents the amount derived from one-fourth cent of gas tax revenue, the amount of the total original allocation. Since maintenance funds may be expended upon secondary city streets, there is no need to designate a large major city street system in order to expend the gas tax funds on maintenance of a larger mileage of city streets. Another point to be considered is the relatively small amount of the annual apportionment. With the small amount of money available it will be many years before a city can widen or construct a very extensive mileage of city streets. At such time as the present major city street system approaches improvement to an adequate standard, the department will not only willingly but gladly approve the designation of additional major city streets. With the expenditure of gas tax funds for maintenance being lim-

ited to streets of major importance, there was a definite reason and a decided advantage to having a large system of such streets. As a consequence numerous cities had extensive systems comprising a great majority of the streets within the city. Furthermore there was no definition or no indication in the law of what constituted a major city street, the only requirement being that streets of major importance should be agreed upon between the department and the legislative body of the city. The Collier-Burns Act changed the name from streets of major importance to major city streets and required that the major city streets should be of greatest general city importance. We now have a criterion to go by in the selection of major city streets, that is, they should be of greatest general city importance.

Opinion of Attorneys

At the time the Collier-Burns Act went into effect I discussed this matter of major city streets with our attorneys particularly with respect to the transition from the old streets of major importance to the new major city streets. They considered that a system of major city streets should be adopted by all cities for expenditure of the gas tax allocation due to the change in the law; that for all practical purposes the system of streets of major importance and a system of major city streets are one and the same. In order to avoid the possibility of any legal difficulties, a clause was included in the first project agreement subsequent to the enactment of the Collier-Burns Act for those cities that had not designated a new system of major city streets, declaring that the streets of major importance previously designated under the provisions of Section 195 of the Streets and Highways Code constituted the approved system of major city streets. This procedure resulted in many cities having an excessively large system of major city streets.

At such time as a city wishes to designate additional major city streets it is requested to reconsider the entire major street system with a view of bringing it within reasonable limits and at the same time include the new streets it wishes to designate. The designation of a new major street system immediately poses many problems. A start on the selection of the system could be made by first formulating a tentative contruction program that you wish to construct with gas tax revenue during the next five years. The streets in that program would then be number one priority for your major street system. Such a construction program would not be binding upon the city, it need not even be official, it is merely a tool for the use of the public works officer in ascertaining those streets that are a "must" in the selection of the major street system.

Width of Streets

There is perhaps no single item which creates more difference of opinion among engineers than the matter of street widths.

A large number of variegated street widths today are hand-me-downs from the horse and buggy days. In those days the right-of-way width on a proposed street was often determined by the subdivider; the necessary width for sidewalks and planting areas was then taken on each side, and what was left in the middle was dedicated for the use of vehicles. Thus we find widths between curbs varying from about 18 feet to 100 feet, and covering the whole range of widths in between, on streets originally laid out to carry the same type and volume of traffic. We all know that a large percentage of the odd-width streets can never be economically altered due to development on adjacent property, and in these cases all we can do is struggle along and make the best of what we have. There are many cases, however, where the adjacent development is such that additional right of way can be acquired within a reasonable cost, and the street widened to an adequate dimension as part of a reconstruction program.

In the early days of state highway construction in California the standard width of pavement was 15 feet. The width of a traffic lane increased progressively to 8 feet, then to 9 feet, then 10 feet and 11 feet before 12 feet was adopted as the width of a traffic lane by the State.

Width of Traffic Lane

In the summer of 1933 the United States Bureau of Public Roads undertook a study to determine the proper width for a traffic lane. The method adopted for the study was to trail and take motion pictures of vehicles in the act of passing. Many interesting facts were developed from the study. Overtaking and passing a vehicle going in the same direction is a much more difficult operation and requires a greater width of road than meeting and passing a vehicle going in the opposite direction. It was observed that both passenger cars and trucks apparently tend to center themselves closely on the center line of their own traffic lane and maintain that position when being overtaken and passed. The average lateral clearance allowed by drivers in overtaking and passing another car was five feet. This clearance was taken regardless of the width of pavement. This apparently does not hold true in opposite direction passing as the drivers seemed to be satisfied with less than five feet clearance on the narrower pavement but will take more than five feet on the wider pavement, there being an apparent tendency to swerve slightly to the right irrespective of whether or not the clearance is more or less than five feet.

Design Standards Adopted

While these studies were made on rural highways, their results apply with equal force to urban street conditions. Speeds of from 25 to 35 miles an hour overwhelmingly predominated in the studies. Speeds that high and higher prevail in most urban areas in California except where traffic is extremely congested. As a result of these studies the American Association of State Highway Officials adopted design standards as follows: For a traffic density of over 200 vehicles per hour traffic lanes 12 feet wide; curbs to be at least two feet from the edge of the pavement; the lateral clearance from the right edge of pavement to the face of walls or to abutments or piers at underpasses at least six feet; the lateral clearance between the left edge of the pavement and the base of a center pier or abutment at least 4½ feet.

... To be continued

Welded Steel Superstructure

By W. R. McINTYRE,
Associate Bridge Engineer

Construction on Ramona Freeway In Alhambra for Almansor Avenue Overhead

ERECTION of a welded steel superstructure for the Almansor Avenue overhead bridge on Ramona Freeway, in the City of Alhambra, was carried out on February 24 and February 25, 1953. This bridge is a part of construction work by Griffith Company, the State Division of Highways contractor, on the 1.7 mile section of the Ramona Freeway from Eighth Street to Jackson Avenue in Alhambra.

It is the first all-welded steel highway bridge of major importance to be constructed over Ramona Freeway. This bridge extends 270 feet between reinforced concrete abutments and two intermediate piers, across six lanes of the east- and westbound freeway, north and south frontage roads and the tracks of the Pacific Electric Railway. A two-lane roadway with two 6-foot sidewalks is being provided on this steel structure, which is 29 feet above the ground at the highest elevation and consists of three spans, two spans 90 feet long and one 86 feet in length. For pedestrian convenience,

Fabricatian af all-welded plate girders at Bethlehem-Pacific Coast Steel Carporation plant in Las Angeles





UPPER—All structural steel in place and field welding of diaphragm connections under way. Note welded shear lugs on top flanges of girders. LOWER—Side view looking northeasterly showing all three spans of steel in place.

north and south abutments have 8-foot wide stairways leading to the sidewalks on the frontage roads.

Designed on Tangent

The structure is designed on a tangent, although the approaches some 100 feet beyond the bridge abutments curve into the bridge and into Almansor Avenue at the existing street grade. The approximate lengths of the approaches on each end of the bridge are 500 feet, with an 8 percent gradient. The profile of the bridge deck follows a 450-foot vertical curve.

Preliminary studies indicated that an all-welded steel girder layout would be more economical than either a riveted steel plate girder, or a reinforced concrete girder structure. Composite action between the steel girders and the concrete roadway slab is obtained by the use of small steel bars or shear lugs welded crosswise of the top flanges of the girders. Abutment and pier footings rest on cast-in-place concrete piles, varying in length from 22 feet to 37 feet.

Steel girders have been provided with a 5-inch crown or camber which has been fabricated into the girder purposely to follow as closely as possible the vertical curve of the bridge

deck. All girders are 4 feet 6 inches in depth and are composed of a ⅜-inch web plate and ¾-inch to 1⅞-inch flange plates. Stiffner plates welded to the side of the web plate vary from 3-feet 6-inch intervals at the supports to 4-feet 6-inch intervals at the center of the span. In the entire structure a total of 2½ miles of welds was used.

Size of Weld

The size of weld varied from 5/16-inch to ⅜-inch in section. All upper and lower chords have been welded by the semiautomatic process, which produced maximum uniformity of weld section. Weld sections were checked by inspection through the use of the modern gamma-ray method by the State Testing Laboratory.

Structural steel was delivered to the site from the Bethlehem Pacific Coast Steel Company plant located in Los Angeles via truck and trailer along city streets. Each truck and trailer conveyed two welded girder sections. A total of 15 girder sections was required for the complete superstructure. Each girder section weighs approximately 11½ tons.

Steel girders were erected in five lines on the bearing assemblies with a 25-ton truck crane equipped with a 60-foot boom and 18-inch channel diaphragm assemblies are bolted in position between the girders, ready for the final field welding to tie the bridge girders together. All members and elements in the steel superstructure are welded and no rivets are being used.

This bridge was designed and is being constructed by the Bridge Department of the State Division of Highways under the general supervision of F. W. Panhorst, Assistant State Highway Engineer, Bridges, with J. W. Green, Southern Bridge Department Representative, and the Bridge Department representative on the project.

The general contractor for this project is Griffith Company. Joe Porcher is general superintendent and Hal McGregor is bridge superintendent. Subcontractor and fabricators, including erection of the steel in place, is Bethlehem Pacific Coast Steel Corporation of Los Angeles. F. C. Todd, Jr., is general manager and R. W. Binder is chief engineer of the steel company.

Unusual Type Road Closure in Modoc Co.

Extreme cold weather and heavy winds at Cedarville Causeway, in Modoc County, combined to produce an unusual type of road closure and present additional problems to maintenance forces.

Cedarville Causeway is a low embankment section constructed across Middle Alkali Lake, a large shallow lake located on Surprise Valley just east of Cedarville. During the cold spell in December the shallow waters of the lake froze, and as the ice cracked, heavy wind and wave action forced the ice cakes onto the causeway and piled them up until the entire roadway was covered to a depth of from 8 to 10 feet.

Heavy duty snow plows aided by a bulldozer to break down the piles were required to remove the piled up ice cake and open the road.





UPPER—Ice piled up 8 to 10 feet high on Cedarville Causeway by high winds.
LOWER—Bulldozer removing ice from causeway.

District Highway Engineers Named

Appointment of two new district engineers in the Division of Highways and transfer of two others have been announced by State Highway Engineer George T. McCoy.

The appointments resulted from vacancies left by the untimely death of Spencer W. Lowden, District Engineer of District VIII, with headquarters at San Bernardino, and the retirement of Mark E. Cessna, District Engineer in charge of planning for District VII, with headquarters at Los Angeles.

The new assignments are as follows:

Edward T. Telford, Traffic Engineer, from Headquarters Office at Sacramento to District VII as district engineer in charge of planning. Telford will serve directly under Assistant State Highway Engineer Paul O. Harding at Los Angeles.

C. V. Kane, District Engineer of District I, with headquarters at Eureka, from that post to district engineer at San Bernardino.

Alan S. Hart, District Engineer of District IX, with headquarters at Bishop, from that post to district engineer at Eureka, replacing Kane.

Milton Harris, Service and Supply Engineer, from Headquarters Office at Sacramento, promoted to district engineer at Bishop, replacing Hart.

McCoy temporarily assigned Assistant Traffic Engineer H. H. Deardorff to the position of acting traffic engineer at Headquarters Office.

Edward T. Telford

EDWARD T. TELFORD, formerly traffic engineer of the California Division of Highways in Sacramento, assumed his new duties as District Engineer, Planning, of District VII headquarters of

. . . Continued on page 53



Milton Harris

RESPONSIBILITY for the improvement and maintenance of state highways in all of Mono and Inyo Counties and in parts of Kern and San Bernardino Counties has been assumed by Milton Harris as district engineer of District IX, Division of Highways, with headquarters in Bishop.

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Clyde V. Kane

AFTER A BRIEF ABSENCE from the State Division of Highways District VIII headquarters in San Bernardino, where he has spent most of his professional career, Clyde V. Kane returned

. . . Continued on page 53



Alan S. Hart

ALAN S. HART, who formerly served District I of the Division of Highways as assistant district engineer, returned to the Eureka headquarters on February 16th as district engineer. He had served in District VIII for 24 years prior to his assignment to Eureka last year.



Hart is thoroughly familiar with the North Coastal district, comprising all of Del Norte, Humboldt, Mendocino and Lake Counties and parts of Siskiyou and Trinity Counties. He will be responsible for the improvement and maintenance of the more than 900 miles of state highways in the area.

Born in Santa Rosa, Hart received his preliminary education in public schools in Gerber and Red Bluff. He later studied civil engineering at Sacramento Junior College and first joined the Division of Highways in Sacramento in 1928 as a junior engineering aid. He worked on highway projects during summer vacations until his graduation from the University of California at Berkeley as a civil engineer in 1930.

Following his graduation he returned to the Sacramento district as a civil engineering aid. He remained in District III until 1945, when he was appointed to the post of district maintenance engineer in District V, San Luis Obispo.

In 1948, as a supervising highway engineer, Hart was sent to the Eureka office, where he assumed administrative duties as assistant district engineer under George F. Hellesoe, at that time district engineer of District I and now maintenance engineer for the Division of Highways at Sacramento Headquarters Office.

Hart was appointed district engineer of District IX in Bishop in October, 1950, remaining there until his present assignment.

Edward T. Telford

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the Division of Highways in Los Angeles on February 16th.

In his new position Telford will be in charge of the planning, location and advance design of the intricate system of state highways and freeways in the Los Angeles metropolitan area, embracing Los Angeles, Orange and Ventura Counties. He succeeds M. E. Cessna, who recently retired.

No stranger to the Los Angeles area and its complicated traffic problems, Telford served there as a resident engineer from 1932 to 1936.

Telford joined the Division of Highways in December, 1927, as a civil engineer in the District VI office in Fresno. In succeeding years he served in district offices in Bishop and Eureka and at Sacramento headquarters, as well as in the Los Angeles area. He was appointed engineer of design for the division in 1950 and became traffic engineer last July.

A veteran of World War I, Telford was office engineer at District I headquarters, Eureka, when he was recalled to active duty in the Army in early 1941. In 1943 he was sent to North Africa and later to the India-Burma theater, where he commanded elements in direct support of driving the Japanese army out of northern Burma. He returned to civilian life in 1946 as a colonel.

In his more than 25 years with the Division of Highways, Telford served in various capacities, both technical and administrative, obtaining well-rounded experience in all phases of highway construction and design.

He is a native of Santa Barbara.

Clyde V. Kane

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on February 23d to take full charge as district engineer.

L. R. McNeely had been the acting district engineer since the death last month of Spencer W. Lowden.

Kane goes to the important San Bernardino district after serving as district engineer of District I, with headquarters in Eureka, since last August. Before his promotion as district engineer in the northwest area, he spent 24 years in District VIII, San Bernardino and Riverside Counties, where he advanced through the ranks to the post of assistant district engineer.

Born in New Mexico, Kane was graduated from the Clear Lake Union High School in Lakeport in 1921. His first engineering job was on a survey party for the Southern Pacific Railroad in the Imperial Valley, and then in Oregon.

Later he entered the University of California, where he received his degree in civil engineering in 1927. After brief periods in South America and in San Francisco, he joined the San Bernardino office of the Division of Highways in 1928 as a draftsman. Successively he became construction inspector, resident engineer on highway construction projects, and chief draftsman.

He entered military service in November, 1942, with the Army Engineers. He served for more than a year as chief of the engineering division for the construction of a portion of the Pan American Highway in Central America. Following that assignment he was sent to Burma, where he was area engineer in charge of constructing and maintaining part of the Ledo Road and nearby airstrips.

Kane returned to civil life in 1946 and was placed in charge of highway location and construction in the San Bernardino district. In 1947 he assumed the post of assistant district engineer of District VIII, serving in that capacity until his promotion and transfer to District I as district engineer.

Milton Harris

Continued from page 52 . . .

Harris, Service and Supply Engineer in the Headquarters Office in Sacramento since 1947, is no stranger to the trans-Sierra district. He served there between 1934 and 1938 as assistant resident engineer, location engineer and finally as the district office engineer and district construction engineer, gaining first-hand knowledge of the district.

A native of Oregon, Harris received his degree in civil engineering from Oregon State College in 1917. Following service in World War I, he was employed in various engineering capacities, joining the Division of Highways in 1928 as an instrument man in the Eureka office.

In 1934 he was assigned to the Bishop office where he worked under the supervision of the late Spencer W. Lowden, then district engineer of District IX.

He was transferred to the Sacramento Headquarters Office in 1938 as an assistant traffic engineer. When construction materials became scarce in the early days of World War II, Harris was assigned the responsibility of working out the materials priority problems for necessary highway construction, including a large mileage of military access roads requested by the Federal Government.

Harris was recalled to military service with the Army Engineers in July, 1942. After serving as post engineer at Camp Kohler, Wisconsin, and the Air Force Storage Depot in Maywood, California, he was sent to Italy. There he was named chief of the transportation section of the Allied Military Government and in that capacity served as traffic engineer of the City of Rome.

The Vatican awarded him the Lateran Cross for aid in re-establishing transportation in Vatican City. He was also awarded the Cross of St. Maurice and Lazarus by the Italian Government for his work in rehabilitating the Italian transport industry.

Returning to civil life in 1946, Harris was placed in charge of inspecting and purchasing war surplus materials for the Division of Highways in the Sacramento Headquarters. Later, as service and supply engineer, he had full charge of and developed procedures for procurement, warehousing and distributing all materials and supplies used by the division.

Harris and his wife moved to Bishop, his appointment as district engineer being effective February 9th.

DISTRICT VII NAMES BEST TEN CONTRACTS COMPLETED IN 1952

EACH YEAR since 1949, the District VII, Los Angeles, Construction Department has judged the contracts completed during the calendar year, and selected the best 10 in order of excellence. Relative positions on the list are determined by rating each contract on the quality of the grading, structures, subgrade, paving, curbs and gutters, finishing roadway, and any other items requiring close supervision and inspection. Other factors entering into the rating are safety, public relations, complexity of the over-all project, and engineering costs over which the resident engineer has direct control.

Obviously every highway contract is a cooperative project requiring the best efforts of both the contractor and the resident engineer, and the ratings therefore reflect credit to both. Following are the selections for the 1952 calendar year:

Last year trophies topped by miniature Galion rollers were presented to N. M. Ball Sons, Contractors, and to H. E. Belford, Resident Engineer, for completing a portion of the Hollywood Freeway between Virgil Avenue and Glendale Boulevard, which was rated the best contract completed during 1951. Certificates were also presented to the contractor's superintendent and the various state engineering personnel who contributed to the successful completion of the work. (The festivities accompanying the presentations took place last September, and were reported in the November-December, 1952, issue of *California Highways and Public Works* under the title "Bonneroo Stag.")

The Second Annual Bonneroo Stag will take place on Friday, April 17, 1953, at the Mona Lisa Restaurant on Wilshire Boulevard, at which time the two perpetual trophies will be presented to the new winners.

Contractor	Description	Resident engineer
1. A. Teichert & Son	Santa Ana Canyon Rd., Peralta School to Riverside County line	A. W. Carr and W. M. McKnight
2. R. A. Erwin	Holt Ave., Hamilton Blvd. to west city limits, Pomona	W. V. Brady
3. Griffith Co.	Long Beach Freeway, Rt. 60 to 223d St.	H. F. Meinke
4. Webb & White	Harbor Freeway, Fourth St. to Temple St.	H. E. Belford
5. Webb & White	Hollywood Freeway, Grand Ave. to Los Angeles St.	R. A. Collins
6. A. Teichert & Son	Ridge Route, Frenchman's Flat to Los Alamos Creek	C. J. McCullough
7. Fredericksen & Kasler	Coast Highway, Santa Clara River Bridge through Montalvo	M. F. Masters
8. Vido Kovacevich Co.	Atlantic Blvd., Telegraph Rd. to Garvey Ave.	J. W. Shaver and R. H. Butler
9. Boddum & Peterson	Pomona Blvd., Ferris Ave. to Potrero Grande Ave.	L. W. Sixt
10. Jesse S. Smith	Ventura Ave., Oakview Ave. to Rt. 151	L. S. Higley

DRIVING IN OUTSIDE LANE

When driving in the outside lane you should drive as far away from the parked cars as the stream of traffic will permit. Drive at a reduced speed and with extra care. Look ahead, anticipate the actions of the people who are on the sidewalk, and it will help you to avoid disaster. If someone should step out from between parked cars, be sure that you can come to a stop in time.

Traffic Paint

Continued from page 43 . . .

California had used Type I for many years so we knew what to expect of it. Type II had also been used at times and something of its over-all performance was known. The durability of the alkyd in general paint formulations is well known among paint technologists. It is most commonly tabbed by the layman as a "synthetic" which of course is in a sense applicable to all paints. Properly adapted to traffic line requirements this alkyd type gives excellent service in many locations. The 50,000 gallons acquired in this instance performed well on surfaces in the interior section of the State. On the coastal areas or in an environment of high humidity it failed quickly. In one instance, a line of this type practically disappeared within 10 days after application. A heavy rain had fallen a few hours after it was applied. This condition, combined with heavy traffic, practically obliterated the line in a very short time. Other locations where traffic was equally severe were well marked by this same paint for several months. *See Figs. 2 and 3.*

Type III Not So Good

Type III conformed approximately to one of the federal specifications for traffic paint. In general it gave good service but it was rather vigorously criticized by the paint crews as having "no body" and spattering excessively during application even though its viscosity, pigment, and nonvolatile content were correct. That this criticism was justified to some degree is apparent in *Fig. 4.* In the immediate foreground is a single line of Type I. Type III lines with the frayed edges are in the background. Some adjustment of this formulation could render it quite acceptable, but we have abandoned it for the present.

Type IV Adopted as Standard

Type IV out-performed the other formulations and has been adopted by the State as our current standard traffic paint. Some modifications have been necessary at times to meet conditions prevailing in the raw materials market. The current specification calls for a definite and detailed formulation. The key substance of this formulation is chlorinated natural rubber, sold under the trade name of Parlon. This material controls the character of the film to a marked degree and aids greatly in reducing the initial drying time—that is the time to reach the state of what we call "no pick-up." Combined with the chinawood oil—pentalyn varnish—it offers a tough film of good durability and abrasion-resisting character.

The greatest deficiency of Parlon as a component of paint films is its incompatibility with many frequently used materials. This particular pentalyn varnish is one of the few vehicles known to afford compatibility sufficient to assure complete package stability for a reasonable length of time. Even in this formulation a certain degree of incompatibility results as the volatile content of the paint evaporates. The same phenomenon existed to a degree in the old "California Formula." It is probably a desirable feature in that it provides a film permeable to water vapor which may form under the paint. Otherwise certain conditions would cause blistering and early failure.

Service Life of Lines

The general serviceability of this Type IV paint is apparent in *Figs. 5, 6 and 7.* The lines shown here are all on concrete and in a location where the traffic count approximates 30,000 vehicles daily. Even on the curves where abrasion and shear are excessive the lines show up well. Although these photographs were taken eight months after application, the lines were in good enough condition to withstand six months more of the heavy wear before being repainted. It should be pointed out that this is an exceptional case, just as failure after two or three months is likewise unusual. The average effective service life of this Type IV line is from 6 to 10 months, the actual life depending upon the location and time of year it is applied. Weather cycles exert a certain if not a definite influence on the service life of the lines. Heavy rains following a long period of high temperature and ultra-violet radiation seem to accelerate failures of many organic films. Naturally the shock and abrasive influence of heavily weighted tires do not lessen the effectiveness of these factors, so traffic lines undergoing such a series of attack will generally show early failure.

Type V Abandoned

Type V formulation had to be abandoned because of compatibility difficulties. This case exemplifies the necessity for large-scale experimentation in manufacture. No difficulties had been encountered in the preliminary small-scale preparation of this paint, but in large-scale production discrepant features were quickly detected. This formulation was replaced by another type of composition in which we attempted to exploit the characteristics of Parlon at a reduced cost of finished product.

About 5,000 gallons of the new formulation was produced and used in various locations over the State. It worked well in general and gave good service as a traffic stripe. However, one of our striping crews turned up a characteristic in the paint which caused it to be dropped from further consideration. The crew placed 80 gallons of the paint in each of two reservoirs on the truck and started laying a stripe one morning. While the paint was being used from one tank the other was being agitated. When the switch-over was made to the second tank the paint was found to be of a consistency of thick mayonnaise and could not be used in the spray at all. This phenomenon could not be reproduced in small scale operations in the laboratory. The manufacturer could do it by agitation in a 500-gallon mixing vat. Such are the anomalies one finds in paint technology and manufacture.

Durability Requisite

Returning again to durability as one of the prime requisites of a traffic stripe, it is well known that portland cement concrete pavement is a much more difficult surface on which to maintain a properly marked traffic stripe than is asphalt pavement. There is a wide variation among paints with respect to durability on similar surfaces, but practically all of those developed up to this time will do better on asphalt than on portland cement. *See Fig 8.* There are several reasons for this difference, the chief one being lack of adhesion of the film to a concrete surface. Concrete is alkaline and tends to saponify the oils and resins in many films. Moisture carrying a salt content creeps through the concrete and under the paint film. For this reason the film must necessarily "breathe," that is, be pervious to





UPPER—California Standard Type IV traffic stripe after eight months' service on U. S. 40 west of Carquinez Bridge. LOWER—Same type after eight months' service on U. S. 40 at west city limits of Rodeo.

water vapor, or it will be pushed off the pavement. It must also possess a degree of plasticity to prevent cracking and chipping as temperature changes and compressions of the film take place under traffic.

Giving a film all of these and other characteristics does not compensate for the moderate solvent action that a fresh paint exerts on asphalt to bind the two surfaces together. Common paint solvents have no perceptible effect on concrete so the adhesion of a paint film to this type of pavement is largely a physical phenomenon.

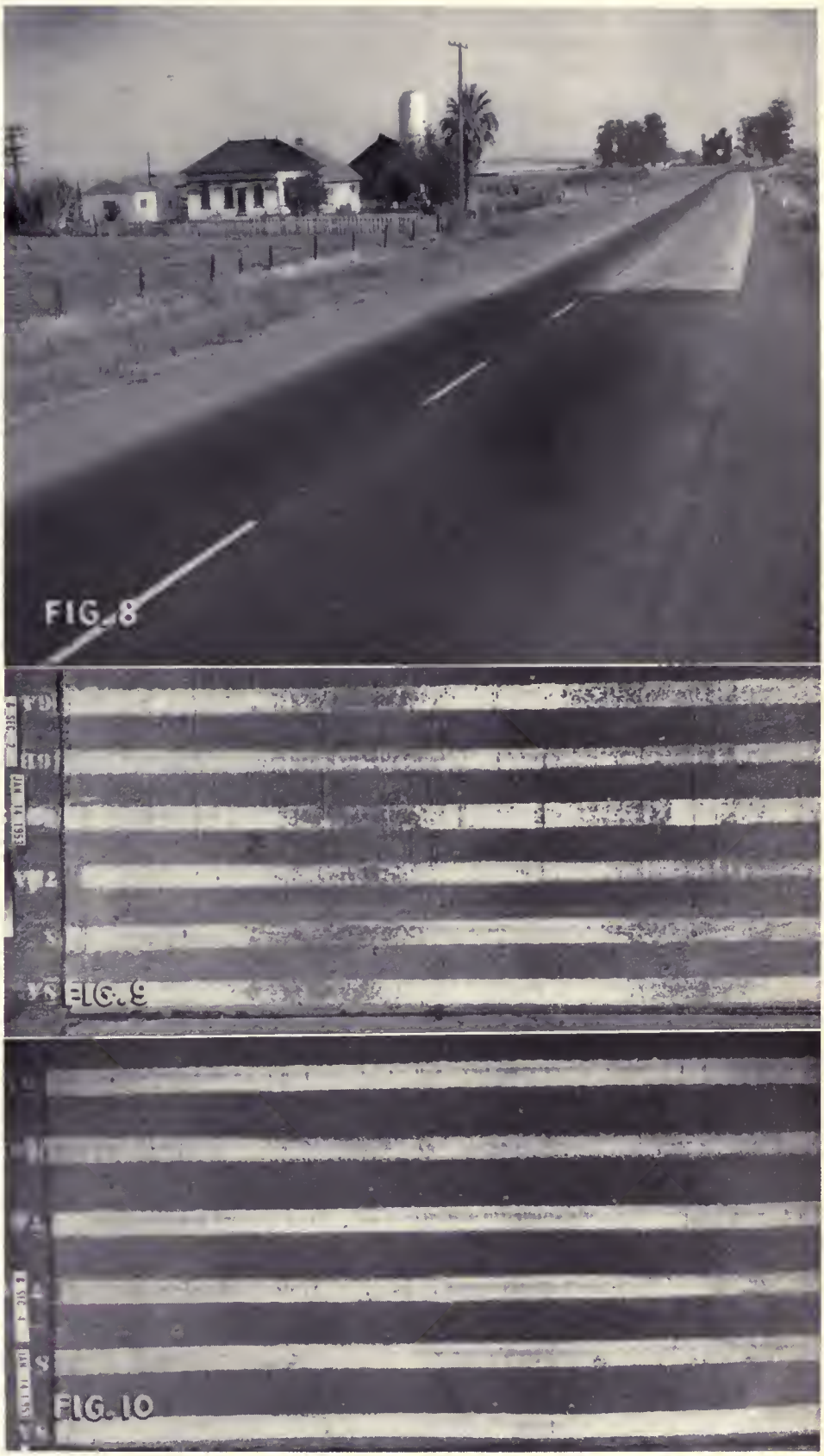
Experiments

The Materials and Research Department has done some extensive experimentation in seeking ways to increase this bond and thus extend the service life of a traffic stripe. *Figs. 9 and 10* show a series of transverse traffic stripes which were all placed on the same day on adjoining sections of concrete. The lines bearing the same number in each photograph are composed of identical paints and were sprayed successively from the same can. For example, line *6A in Fig 9* was placed within two minutes of the laying of *6A in Fig 10*. The only difference between the two sections was in a pretreatment of the concrete under the lines shown in *Fig. 10*.

The pretreatment consisted of spraying the concrete on which lines were to be placed with a dilute alcoholic solution of phosphoric acid. The lines were placed about 20 minutes following the acid treatment. This particular acid is ideal for the purpose because it neutralizes any alkali on the surface and leaves a thin film of insoluble calcium phosphate as an anchor for the paint film. The effectiveness of the treatment is obvious from the photographs. At the time the photographs were taken the lines had been exposed for six months on a highway having an average daily traffic of about 30,000 cars. *Line No. 8* is California's standard stripe now in use.

Question Not Determined

It would be nice if we could assume that this practice would show equally well at all locations under all traffic conditions. Unfortunately, where there is sand and gravel on the road, as is



UPPER—Camparative serviceability of traffic line paint an asphalt (fareground) and cancrete (background). CENTER—Experimental transverse traffic lines an bare concrete after six manths' expasure. Traffic 30,000 vehicles daily. LOWER—Same as center except that cancrete had been pre-treated with phasphoric acid.

often the case at intersections, the phosphoric acid does not seem to do any good. The sand and mud carried onto the pavement by the tires of vehicles entering the highway are too effective as a grinding agent, especially during wet conditions. On the other hand, on curves where the shear and wear by tires are excessive, the wearing qualities of the stripe are somewhat extended beyond the normal by this pretreatment. Whether or not the pretreatment of concrete for traffic striping is economically defensible is still to be determined.

Lines on Curves

One of the factors involved in the apparent lack of correlation of the observed service life of traffic stripes is the design of the highway. A narrow two-lane highway which causes a driver to veer from the shoulder towards the center line will invariably show stripe failure earlier than a wide four-lane highway where the tires contact the line less frequently. Likewise the line on a curve is much more attractive to all of us as drivers than the shoulder or edge of the pavement. A glance at the lines on a straightaway and those on curves will tell the story. The line on a curve will rarely last as long as that on the straight stretches. The only remedy for this situation is to eliminate the curves or modify them. That, of course, is impractical on many roads and probably can not be achieved in any substantial measure on many others. Because of these factors we try to use a paint that has a high over-all performance rating as well as one which meets other requisites of present day traffic conditions.

Drying Time of Paint

One of the more important additional requirements is the drying time of the paint—the time of "no pick up" when traffic runs over the line. Our present formulation meets this condition in seven to ten minutes, while specifications demand a maximum of 15 minutes. In spite of this short time, careless motorists ruin a considerable portion of the traffic line by running over it before the line has "set." Probably most drivers have noticed stripes with tangential faint lines extending into the center of the traffic lane. Each of these is due to a careless or indifferent motorist who has crossed the stripe within seven or eight minutes of its placement. Such maneuvers not only create an unsightly highway but ruin the portion of line where the wheels cross it. So far no one has developed a traffic paint that will "set" instantaneously upon being placed on the pavement.

Pending such development the cooperation of the motoring public is required to maintain a neat serviceable traffic stripe.

Some research men, notably the English, have reported excellent results from the use of hot mixes as traffic lines. These mixes are not thought to be practicable for use in California.

Performance Specification

It might be said in passing that some vendors are very anxious for the State to adopt a performance specification for traffic paints. This would be desirable certainly if we could devise a test which could be performed quickly and would be a guarantee of the performance of the paint on the highway. As has been indicated in the foregoing, no such test has been devised up to now, so far as we know. A specification involving a few performance tests combined with composition requirements seems to be the best method of securing a uniform product that will perform in accordance with previously established standards.

Most of this discussion has been centered around the vehicle of the traffic paint. It is probably the most important part of the paint in so far as durability, drying time, etc., are concerned. The pigment, nevertheless, is of great importance and plays its role in most of the characteristics displayed by a paint. Of prime importance in any paint is the relative volume of the pigment and nonvolatile vehicle. This factor is known to the trade as pigment volume concentration or "P. V. C." and is usually expressed as percentage. The optimum value must be determined by experiment for each vehicle and the use to which the paint is to be put must be considered in this respect. Our traffic paint specification calls for about 45 percent P. V. C. This value is a compromise among the requirements for good visibility, durability and the ability of the vehicle to hold small glass spheres or "beads" used to reflectorize the line to increase night visibility. Where "beads" are not used, a somewhat higher P. V. C. is generally desirable.

Reflectorized Lines

The effect of the reflectorized lines is not realized by many motorists. It has not escaped the observing driver, however. Many people have asked what caused the line to "come up at you" at night and to point out how much better some lines show at night than others. Some people have even noticed how the night line has appeared white and clean while in daylight it has has been dirty and somewhat discolored. That, of course, is because we see at night the reflected surface of that portion of paint under the beads. It has been protected from dust and surface wear and consequently is clean.

The failure of such lines to function satisfactorily in rain or when pavements are wet is the greatest deficiency in the traffic striping program. Water disperses light effectively, so instead of getting a reflection from our headlights, we get nothing that is distinctive. It is an unfortunate fact from the Highway Engineer's viewpoint because during such weather conditions a line is needed more than during good weather. Some compensation may be realized in the fact that fog is not so efficient in the dispersion process and a line may be followed reasonably well if the fog is not too dense.

Rainy Weather Failure

The discoloration and unsightly appearance that a "beaded" line acquires after a few months exposure is due largely to traffic dust, although certain constituents of the paint vehicles may be part of the trouble. Overcoming this is another problem. It is not insoluble, for the surface could be washed if conditions would warrant such procedure. I fear, however, the rainy weather failure will remain with us indefinitely. It is impossible to repeal the laws of physics, but an answer to the difficulty may lie in a completely different approach. The man who accomplishes the feat of developing an applicable and practical solution to the problem will have earned his niche in the hall of Highway Engineering Fame.

There are numerous other details involved in the traffic paint program—too many, in fact, to attempt to describe them completely. The factors of prime consideration which guide the program may be listed in an approximate order of importance as applicability, durability, visibility, drying time and cost. Interchange of some of the listed properties would not be disturbing.

Storm Damage

Continued from page 36 . . .

Yager Creek Bridge

The west abutment of Yager Creek bridge near Carlotta was partially undermined and settled about four inches. A railroad bridge immediately downstream was completely destroyed. Grizzly Creek bridge was seriously damaged when a group of three redwood trees fell across it, demolishing the concrete railing and cracking the downstream girder of the center span.

In addition to a major slipout and a number of smaller slides and slipouts, a large slide developed about 17 miles east of Alton. This slide broke back about 600 feet on the steep hillside. Although the slide removal on the roadway was accomplished to permit traffic to proceed, the major proportion of the work remains. A large mass of unstable material remains at the top of the slide. Benching and the removal of about 20,000 cubic yards of material will have to be done before the area is stabilized.

It was due to the efforts of the maintenance crews working day and night throughout the storm that losses were not considerably greater than they were. The work done to date by state forces and equipment supplemented by rented equipment is of an emergency nature to restore two-way travel throughout the area. Several months will be required before conditions are restored to normal.

FAIR WEATHER AND FOUL PLAY

Fair weather and foul play often go together on the highway and sunshine cannot save a driver from the consequences of speeding and carelessness. Approximately 70 percent of all traffic accident fatalities occur on dry pavements.

West Sacramento Freeway

Continued from page 40 . . .

minor grading contract for paving the county road at the West Capitol Avenue Ramp Overcrossing. This permits county road traffic to pass over the freeway without interfering with construction operations throughout the current and remaining contracts.

Bids will be received April 8th for a contract for the paving of the freeway, surfacing connecting ramps, and constructing separation structures and an interchange at Harbor Boulevard. One final contract, which will be advertised later, will provide signing and illumination at critical locations throughout the project.

It is hoped the completed project may be opened for traffic use sometime late in the fall of this year.

Expressways Do Not Adversely Affect Property Values

In an article titled "Expressways and Real Estate Values," Adrian F. McDonald, M. A. I., conductor of lectures and field courses on appraising at Yale University, has this to say about the effect expressways have on residential properties in proximity to them:

"In considering areas near the expressway, all sections of Connecticut suitable for residential use and within easy access to the Merritt and Wilbur Cross highway sections have increased in desirability—rate of marketability and value. Today it is easier to sell properties in the proximity of the Connecticut expressway routes than ever before and at better prices.

"The results of a comprehensive survey of towns in Fairfield County where the Merritt Parkway has been in use for several years are so clear cut as to be remarkable in their consistency—sales of land adjoining the parkway and in the vicinity showed a substantially higher level of prices than comparable land some distance removed.

"Sales for the past five years in Greenwich and Darien in Fairfield County show absolutely no adverse effects from extremely heavy truck traffic on U. S. 1 even where the rear lines of properties may be within 100 to 150 feet from the traffic."

In Memoriam

THOMAS A. BEDFORD

Thomas A. Bedford, 83, former assistant engineer of the Department of Surveys and Plans in the State Division of Highways, died in Redding, Shasta County, March 14th.

From 1911 until 1923 Bedford was Division Engineer for the State in the second district, embracing Shasta, Siskiyou, Modoc, Lassen, Tehama and Trinity Counties. During that time he supervised the construction of the first paved highway in the area and the first road from Redding to Dunsmuir, Siskiyou County.

In 1923 he was transferred to Willits, Mendocino County, where he was made engineer for the district including Del Norte, Humboldt, Mendocino and Lake Counties.

He was transferred to Sacramento in 1928 where he was assistant engineer for the Department of Surveys and Plans, a post he held until his retirement in 1939. In that position he laid out most of the modern highway routes through the State.

He was at one time county engineer for San Diego County and also supervised construction of a railroad in Mexico and a highway in Cuba.

He leaves his sons, T. A., Jr., of Willow Run, Mich., vice president and general manager of the Kaiser-Fraser Corporation, and Clay H. of Ann Arbor, Mich., president of the Chase Aircraft Company; daughters, Mrs. Frances Lindt of Dunsmuir and Mrs. Mary Sue Fitzgerald of Merced; seven grandchildren and one great grandchild.

MAKING HIGHWAYS SAFE

A "safe" highway is only as safe as its users wish to make it. This is true no matter what speed limits, highway engineering and traffic controls are devised to protect the motorists.

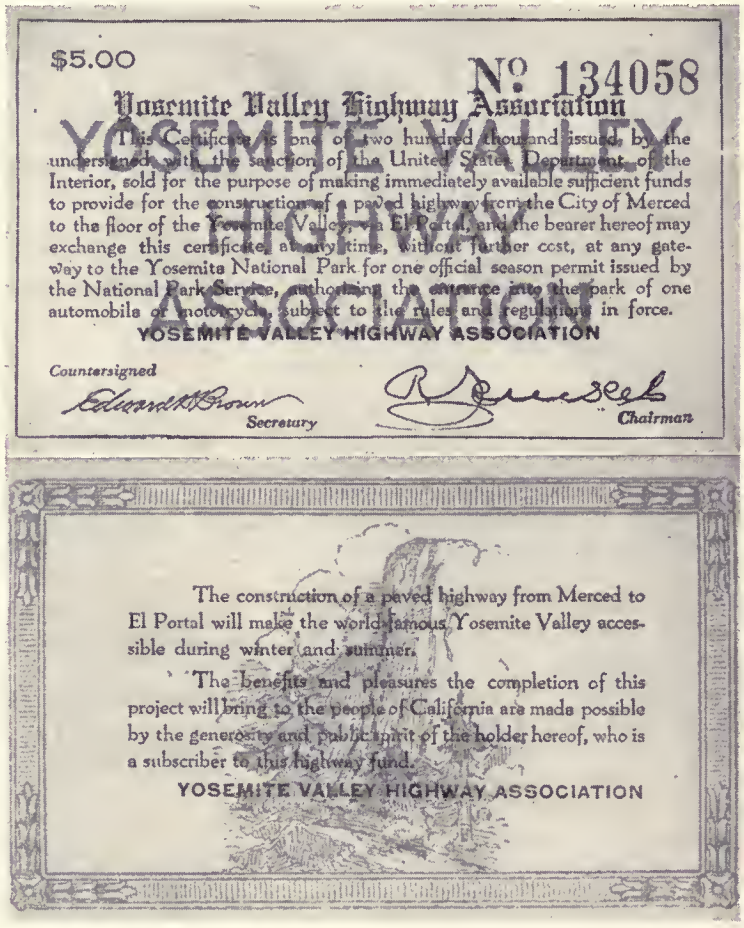
HIGHWAY FUND WAS SHORT IN 1919, TOO

With the California Legislature wrestling with the problem of how to provide additional millions to overcome deficiencies on the State Highway System, James R. Wilson, former Sacramento postmaster, and other old-time good roads enthusiasts recall a campaign launched by the Yosemite Valley Highway Association on May 22, 1919, to raise $1,000,000 which, with $700,000 of state and federal money would provide for construction of a paved highway from Merced to Yosemite Valley via El Portal.

The association composed of commercial organizations, civic bodies and automobile dealers of the State, sponsored a campaign to sell 200,000 certificates at $5 each. Under the plan each motorist in the State (the auto registration in 1919 was 477,450) was asked to subscribe $5 receiving in return from the National Park Service a permit to Yosemite Park, the permit "to be good for any one of the succeeding seasons."

Governor William D. Stephens bought the first of the 200,000 certificates offered and issued a statement calling on public spirited citizens to give their support to the campaign.

In his book "California Highways," Ben Blow noted that in July, 1926, "about $112,000 are being held in trust in San Francisco to finance paving of the Merced to Yosemite Highway. The money was raised in 1919 by automobile clubs and civic organizations by the sale of automobile permits to enter Yosemite Park, under an agreement with the Secretary of the Interior that the money would be held until the State completed the grading. It is proposed to use this fund next spring to defray the cost of placing an oil macadam surfacing on the Merced Canyon section."



About 1,000,000 cubic yards of earth and rock were moved on the Briceburg unit of the project. In addition a crushed rock surfacing, 4 inches thick and 20 feet wide, was applied. Five bridges were necessary across Bear Creek, Slate Gulch, Sweetwater Creek, South Fork and Merced River. The grading, surfacing, and the bridges represented an expenditure of about $1,200,000.

The Chairman of the Yosemite Valley Highway Association was Rudolph Spreckels. He appointed a committee of 28, consisting of H. R. Basford, President of the California State Automobile Association; Frederick J. Koster, John S. Mitchell, Richard Prosser, Robert Newton Lynch, Baldwin Vale, Edward H. Brown, and Percy Towne of San Francisco; Joseph E. Caine and Robert W. Martland, Oakland; Watt L. Moreland, W. H. Keller, H. D. Darlington, P. H. Greer, Fred L. Baker, and Lorin A. Handley, of Los Angeles; Wm. Tompkins and Melville Klauber, San Diego; L. A. Nares and Mayor W. F. Toomey, Fresno; George Wright, Santa Barbara; Dudley Saeltzer, Redding; John R. Graham, Merced; W. G. Scott, Bishop; C. A. Barlow, Bakersfield, and Frank Miller, Riverside.

Philip T. Prather, automobile dealer of San Francisco, was chairman of the central coast counties section of the association in the campaign.

DINOSAUR CANYON

Dinosaur Canyon, located 60 miles north of Flagstaff in Arizona, is reported by the National Automobile Club to be flanked by immense rocks on which are found tracks of the dinosaur.

SPEEDING

Motorists are not killed by speeding in itself. They are usually killed by the sudden stop. A car traveling at 60 miles per hour strikes with the same impact as it would if it were dropped from the top of a nine-story building.

GIVE AND TAKE

Driving in traffic calls for a good deal of give and take. The wise motorist is willing to give and take graciously in every driving situation for he knows that a little courtesy will go a long way to keep him safe.

Steel Superstructure for Daniels Railroad Spur Underpass

By W. R. DOUGLAS, Resident Engineer

It was a great day for the sidewalk superintendents in the Los Angeles Civic Center area, when steel plate girders for the Daniels Spur Underpass were set in place. The 100,000 motorists who daily pass this construction project eyed approvingly construction progress that will eventually eliminate the traffic bottleneck that has long existed at Alameda and Aliso Streets in downtown Los Angeles.

The Daniels Railroad Spur Underpass is part of the project that includes the Alameda Street Underpass and one-third of a mile of divided concrete roadways which will extend the existing end of the Santa Ana Freeway eastward from the Los Angeles Civic Center. When completed the 180-foot-long structure will provide the

UPPER LEFT—Raising steel girders from truck to place on piers. Note great number of sidewalk superintendents. UPPER RIGHT—Swinging girder into position. LOWER—Girders for first span in final position. Note Los Angeles Union Station in background.



Southern Pacific Railroad a single-track bridge across the freeway for freight service to commercial enterprises south of the freeway.

The structure has three spans of 77-, 61- and 41-foot lengths. Girder sections measure 90 inches in height. Pictures show the Union Steel Company of Los Angeles, structural steel subcontractor, placing the steel girders. Delivery of the girders through crowded traffic was effected with a minimum of delay and erection of the steel was performed without a hitch. A Northwest 80 crane was used to hoist the steel girders in place. Maximum girder weight for the 77-foot girders is 27.5 tons.

A portion of the steel erection was televised by Station KTLA of Los Angeles and reports agree the steel workers gave stellar performances.

Next and final steel erection set for the project is for the railroad section of the Alameda Underpass. Contractors for the project are G. W. Peterson and J. W. Baker of Los Angeles.

HIGHWAY BIDS AND AWARDS

JANUARY, 1953

ALAMEDA COUNTY—In the City of Oakland, on Fallon Street between Seventh and Eighth Streets, about 0.05 mile to be graded and paved with Portland cement concrete on cement treated subgrade. District IV, Route 105, Gallagher & Burk, Inc., Oakland, $17,726; O. C. Jones & Sons, Berkeley, $18,203; J. Henry Harris, Berkeley, $21,780. Contract awarded to Ball & Simpson, Berkeley, $17,097.60.

CONTRA COSTA COUNTY—On Freitas Lane, 600 feet south of Tregallos Road, near the City of Antioch, three prefabricated metal buildings to be furnished and erected, gasoline and diesel storage tanks and appurtenances to be furnished and installed, wash rack to be constructed, existing well to be deepened, fence to be constructed, and sewer, water, and electrical facilities to be installed. District IV, Antioch Maintenance Station. Da Roza-Ribal, Inc., Dutch Flat, $27,879; Robert Bardell, Oakland, $28,606; Hancock Construction Co., Lafayette, $28,967; J. Henry Harris, Berkeley, $31,264. Contract awarded to C. Norman Peterson, Berkeley, $27,439.60.

IMPERIAL COUNTY—At intersection of Holt Avenue and Pine Road, at Orita Turn and at intersection of Wiest Road and Main Street, a net length of about 1.3 miles, to be graded and surfaced with road-mixed surfacing on cement treated base. District XI, Routes 187, 201, Sections B, C, C. Esby C. Young, D. B. A. E. C. Young, San Fernando, $139,-619; Norman I. Fadel, North Hollywood, $139,896; James E. Roberts, San Bernardino, $147,260; Clyde W. Wood & Sons, Inc., North Hollywood, $161,059. Contract awarded to Basich Bros. Construction Co., N. L. Basich & R. L. Basich, South San Gabriel, $131,654.50.

LOS ANGELES COUNTY—At the intersection of Fifth Avenue and Bellevue Avenue in the City of Pomona, full traffic-actuated signal system and highway lighting to be furnished and installed and channelization to be constructed. District VII, Routes 19, 77. Paul R. Gardner, Ontario, $19,599; Electric & Machinery Service, Inc., South Gate, $20,117; Fischbach and Moore, Inc., Los Angeles, $21,060; C. D. Draucker, Inc., Los Angeles, $21,386. Contract awarded to Westates Electrical Construction Co., Los Angeles, $19,239.50.

LOS ANGELES COUNTY—In the Cities of Compton and Long Beach, on Artesia Street between Alameda Street and Long Beach Boulevard, about 0.8 mile to be graded and paved with asphalt concrete on untreated rock base, to provide a four-lane divided highway. District VII, Route 175. Vido Kovacevich Co., Rosemead, $212,669; J. E. Haddock, Ltd., Pasadena, $214,311; Griffith Company, Los Angeles, $215,209; J. A. Thompson & Son, Contractors, Inglewood, $216,565; Ukropina-Polich-Kral, San Gabriel, $217,773; Warren Southwest, Inc., Torrance, $222,994; Hess Construction Co., Inc., Long Beach, $228,470. Contract awarded to M. S. Mecham & Sons, South Gate, $211,444.30.

MONTEREY COUNTY—At intersection of Monterey-Castroville Road with Salinas-Watsonville Road, full traffic-actuated signal system and highway lighting to be furnished and installed. District V, Routes 22, 56, 118; Sections A, I, J, A. L. H. Leonardi Electric Construction Co., San Rafael, $13,-595; R. Flatland, San Francisco, $13,930; Howard Electric Co., Gilroy, $14,442. Contract awarded to R. Goold & Son, Stockton, $12,930.

SAN LUIS OBISPO COUNTY—Between Marsh Street and San Luis Obispo Creek in the City of San Luis Obispo, about 2.3 miles to be graded and a base constructed of imported base material on imported subbase material; ramps, connections and city streets to be graded and paved with plant-mixed surfacing on imported base material and cement treated base, to provide a four-lane divided highway. District V, Route 2. John Delphia and M. J. Ruddy & Son, Patterson, $689,037; M. J. B. Construction Co., Stockton, $784,634; Fredrickson & Watson Construction Co., Oakland, $785,894; McCammon-Wunderlich Co., Palo Alto, $788,129; Valley Paving Co., Pismo Beach, $816,344; Granite Construction Co., Watsonville, $818,607; Clyde W. Wood & Sons, Inc., North Hollywood, $827,666. Contract awarded to Madonna Construction Co., San Luis Obispo, $573,145.15.

TUOLUMNE COUNTY—At Dan's Creek, about one mile southeast of Jacksonville, a reinforced concrete bridge to be widened and approaches constructed. District X, Route 40, Section A. Friant Construction Co., Fresno, $30,398; Beerman & Jones, Sonora, $32,934; R. E. Hertel, Sacramento, $34,781; J. Henry Harris, Berkeley, $36,757; B. S. McElderry, Berkeley, $50,504; Owl Truck & Construction Co., Compton, $55,251. Contract awarded to Paul E. McCollum, Richmond, $26,349.50.

F. A. S. County Route

NAPA COUNTY—On Silverado Trail at Conn Creek, about five miles south of St. Helena, about 0.4 mile to be graded and surfaced with road-mixed surfacing on untreated rock base. District IV, Route 607. Huntington Bros., Napa, $21,308; B. S. McElderry, Berkeley, $21,483; Slinsen Construction Co., Napa, $22,167; Arthur B. Siri, Inc., Santa Rosa, $23,283; E. A. Forde Co., San Anselmo, $24,593; Brown-Ely Co. Contr., Corte Madera, $24,759; I. J. Ely Co., Larkspur, $25,877; Harms Bros., Sacramento, $27,705; Fredrickson Bros., Emeryville, $27,-907; O'Connor Bros., Red Bluff, $28,183; J. Henry Harris, Berkeley, $28,491; Ace Excavators, Oakland, $29,613. Contract awarded to Harold Smith, St. Helena, $20,889.

FEBRUARY, 1953

ALAMEDA COUNTY—At Forty-second Avenue off ramp about 0.2 mile in length to be resurfaced with plant-mixed surfacing, and curbs to be constructed in Oakland. District IV, Route 69. O. C. Jones & Sons, Berkeley, $6,733; Independent Construction, Oakland, $6,892.50; Lee J. Immel, San Pablo, $7,698.50; J. Henry Harris, Berkeley, $8,-865.80; Frederickson & Watson Construction Co., Oakland, $11,912. Contract awarded to Gallagher & Burk, Inc., Oakland, $6,489.

ALAMEDA COUNTY—At the intersections of Jackson Street with Harder Road and Eastshore Freeway Ramps, traffic signal systems and highway lighting to be furnished and installed. District IV, Route 69, 105, Sections D, A. Scott-Buttner, Electric Company, Inc., Oakland, $13,975; Manning and Whitaker, Inc., San Francisco, $14,926; Underground Electric Construction Company, Oakland, $16,292; Howard Electric Company, Gilroy, $16,409; R. Goold and Son, Stockton, $16,748; R. Flatland, San Francisco, $15,479; L. H. Leonardi Electric Construction Company, San Rafael, $15,325; T. L. Rosenberg Company, Oakland, $17,552; Jones Electric Company, Inc., Hayward, $15,850; Abbett Electric Corporation, San Francisco, $23,058. Contract awarded to Hall-Sloat Electric Company, Inc., Oakland, $13,660.

EL DORADO—At Locust and Washington Streets, in the City of Placerville, two reinforced concrete bridges to be constructed, and approaches and city streets to be graded. District III, Route 11. Tumblin Company, Bakersfield, $303,804; James P. Morton, Placerville, $304,730.39; Thomas Construction Company, Fresno, $336,632; Dan Caputo, San Jose, $337,630; Bishop, Younger, Bradley Company, San Francisco, $350,934; Young & Smith Construction Company, Salt Lake City, Utah, $351,-988; Lord & Bishop, Sacramento, $355,782; Charles MacClosky Company, San Francisco, $356,413; Granite Construction Company, Watsonville, $361,-453; Guy F. Atkinson Company, South San Francisco, $364,926.65; Paul E. McCollum & C. L. Cypher, Richmond, $384,438; George Pollock Company, Sacramento, $385,179; Fredrickson Bros., Emeryville, $387,337; Nomellini Construction Company, Stockton, $398,630.50. Contract awarded to Fredrickson & Watson Construction Company, Oakland, $294,999.30.

IMPERIAL—Between 2.6 miles east of Calexico and Hemlock Canal (Portions) about 4.8 miles in net length to be graded and surfaced with road mixed surfacing on imported base material. District XI, Route 202, Section C. Basich Bros. Construction Company, N. L. Basich & R. L. Basich, San Gabriel, $276,462.80; Webb and White, Los Angeles, $295,-978; E. C. Young, San Fernando, $303,933; Norman I. Fadel, North Hollywood, $309,201; Arthur H. Famulars and Roland T. Reynolds, J. V. Anaheim, $310,522.50; Dimmit and Taylor, Monrovia, $342,-481.10; Clyde W. Wood and Sons, Inc., North Hollywood, $346,463.20; Flickinger and Welker, Inc., Los Angeles, $390,938. Contract awarded to James E. Roberts, San Bernardino, $251,728.20.

LOS ANGELES—Roadside development of State Highway in Los Angeles County, between 174th Street and Rosecrans Ave. District VII, Route 164-Rdo. B., Tor., A, Haw. F. A. Tetley and Son, Tetley Nurseries, Corona, $8,303.21; James E. Boothe, Compton, $9,240.58. Contract awarded to Gonzalez and Puerta, Lomita, $6,954.27.

LOS ANGELES—Between Route 60 and 223d Street in the City of Long Beach, about 2.5 miles in length of roadside areas to be prepared and planted. District VII, Route 167, LBch. Stephen L. Vistica, San Mateo, $19,777; Gonzales and Puerta, Lomita, $19,899.80; Dana R. Tyson Company, Sacramento, $21,628; D. and M. Sprinkler Company, Long Beach, $22,914.80; Keith E. Card, Long Beach, $22,964.28; Justice-Dunn Company, Oakland, $23,888.80; James E. Boothe, Compton, $24,-381.60; Castro & Fisher, Glendale, $25,504.54. Contract awarded to Jannoch Nurseries, Altadena, $18,-014.64.

ORANGE—Between Peralta School and Riverside County Line, about 6.3 miles in length, roadside areas to be prepared and planted. District VII, Route 43, Section B. Jannoch Nurseries, Altadena, $8,400; Stephen L. Vistica, San Mateo, $9,375; Dana R. Tyson Company, Sacramento, $10,987; Castro and Fisher, Glendale, $11,170.75; Henry C. Soto Corporation, Los Angeles, $14,548. Contract awarded to Justice-Dunn Company, Oakland, $7,641.70.

SACRAMENTO, SOLANO — On Steamboat Slough and Cache Slough, about 3.1 miles west of Ryde and about 2.4 miles north of Rio Vista, respectively, three ferry boats to be repaired, cleaned and painted. District X, Route 100, 99, Section A, A; A. Moore Dry Dock Company, Oakland, $17,936; Dowrelio's Boat Works, Crockett, $27,486. Contract awarded to Colberg Boat Works, Stockton, $16,758.

SAN BERNARDINO—City of Colton, at the intersections of I Street with Eighth Street, Tenth Street, and Mt. Vernon Avenue, a traffic signal system and highway lighting to be modified, a fixed-time traffic signal system and highway lighting, and a full traffic-actuated signal system and highway lighting to be furnished and installed. District VIII, Route 26, 43, 31-Col. Paul R. Gardner, Ontario, $17,982; Electric and Machinery Service, Inc., South Gate, $18,368; Drury Electric Company, San Bernardino, $25,386. Contract awarded to Fischbach and Moore, Incorporated, Los Angeles, $17,568.

SAN BERNARDINO—City of Barstow, at the intersections of Main Street with First Street and Second Street, traffic-actuated signal systems and highway lighting to be furnished and installed. District VIII, Route 31, 58-Bsw. Electric and Machinery Service, Incorporated, South Gate, $23,627. Contract awarded to Paul R. Gardner, Ontario, $22,076.

SAN DIEGO—Between Vista and Escondido, portions, about 0.5 mile on new alignment to be graded and surfaced with P. M. S. on C. T. D. over selected material; about 6.1 miles to be widened, C. T. D. to be constructed and P. M. S. to be placed over existing surfacing and C. T. B. and seal coats to be applied over both new construction and resurfacing. District XI, Route 196, Section B, Esd. Cox Bros. Construction Company, Stanton, $237,995; R. A. Erwin, Colton, $243,513.25; Einer Bros., Incorporated, Escondido, $279,386; Flickinger-Welker, Incorporated, Los Angeles, $283,208; Daly Corporation, San Diego, $294,875. Contract awarded to Ralph B. Slaughter, Julian, $234,368.

SAN DIEGO—At Palm City Interchange, about 0.1 mile in length, to be graded and surfaced with P. M. S. and the existing highway lighting system to be modified. District XI, Route 2, 199, Section G, A. Contract awarded to Griffith Company, Los Angeles, $18,501.45.

SAN LUIS OBISPO—Near Shell Beach, Highway lighting systems to be furnished and installed. District V, Route 2, Section E. Clines Electric, San Luis Obispo, $6,242; Ets-Hokin and Galvan, Wilmington, $6,654; Howard Electric Company, Gilroy, $5,692; L. H. Leonardi Electric Construction Company, San Rafael, $7,275. Contract awarded to Gallagher and Ochs, San Luis Obispo, $5,389.

TULARE—Between Tulare Airport and Tagus, about 7.9 miles in length to be surfaced with P. C. C. on C. T. S. and with P. M. S. on U. R. B. District VI, Route 4-B, Tul, F. Gordon H. Ball and San Ramon Valley Land Company, Berkeley, $1,061,532.40; Griffith Company, Los Angeles $1,095,399.50; Webb and White, Los Angeles, $1,125,106; Ukropina-Polich-Kral, San Gabriel, $1,128,003.70; Fredrickson and Watson Construction Company, Oakland, $1,148,413.70; M. J. B. Construction Company, Stockton, $1,192,715; Peter Kewit Sons Company, Arcadia, $1,204,253. Contract awarded to Guy F. Atkinson Company, South San Francisco, $1,055,875.

TULARE—In and adjacent to the City of Porterville, on Route 127 between Cornell Street and Park Street about 0.3 mile to be surfaced with P. M. S. over C. T. B. and highway lighting to be furnished and installed. District VI, Route 127-Ptrv., B. Dicco Incorporated, Bakersfield, $31,205.20; C. F. Oliphant, Hanford, $32,400; Friant Construction Company, Fresno, $34,411.50; Baum Construction Company, Fresno, $38,262; Gene Richards, Fresno, $38,428; Griffen Company, Los Angeles, $38,890.50. Contract awarded to Gordon H. Ball and San Ramon Valley Land Company, Berkeley, $30,781.

TULARE—In Tulare County, City of Tulare, at the intersection of Tulare Street with L Street. Traffic signal system to be furnished and installed. District VI, Route 134-Tul. L. H. Leonardi Electric Construction Company, San Rafael, $3,100; Dale Electric, Fresno, $3,395; Robinson Electric, Fresno, $3,600; A. C. Electric Company, Bakersfield, $5,290. Contract awarded to R. Goold & Son, Stockton, $2,975.

VENTURA—Between Point Mugu and Little Sycamore Creek, portions, embankment slopes to be reconstructed and heavy, medium extra heavy, and extra heavy stone riprap to be placed. District VII, Route 60-A. Guy F. Atkinson Company, Long Beach, $288,525. Contract awarded to J. B. Stringfellow Company, Riverside, $233,350.

F. A. S. County Route

LOS ANGELES—On Rosecrans Avenue, between San Gabriel River and Lakewood Blvd., about 1.8 miles in length to be graded and surfaced with P. M. S. length, to be graded and surfaced with P. M. S. on untreated rock base and existing pavement. District VII, Route 840. Osborn Company, Pasadena, $153,244; J. A. Thompson and Son Contractors, Inglewood, $159,592; Warren Southwest, Inc., Torrance, $159,912.70; Jesse S. Smith, Glendale, $161,145; J. E. Haddock, Ltd., Pasadena, $161,700; M. S. Mecham and Sons, South Gate, $163,307; Griffith Company, Los Angeles, $163,364; Hess Construction Company, Inc., Long Beach, $171,676.50; Robert E. L. Parker Company, Claremont, $177,477; Charles MacClosky Company, San Francisco, $194,713; Basich Bros. Construction Company, N. L. Basich & R. L. Basich, South San Gebriel, $195,663. Contract awarded to Vido Kovacevich Company, Rosemead, $145,418.50.

March, 1953

CONTRA COSTA AND SACRAMENTO COUNTIES—Across San Joaquin River at Antioch, portions of the existing bridge to be cleaned and painted and a painter's catwalk to be constructed. District X, Route 11, Sections A, C. J. P. Carroll Co., Los Angeles, $83,470; Allied Painters and Decorators, Inc., Oakland, $86,236; R. W. Renade and Co., Berkeley, $87,694.60; Deemer and Deemer, San Francisco, $96,347.20. Contract awarded to Eric Lundeen, Inc., Los Angeles, $47,663.

KERN COUNTY—At Wheeler Ridge Maintenance Station a well to be drilled and cased. District VI, Route 4, Section B. Williams & DeVoe, Wasco, $7,840.90; B. & B. Drilling Co., Bakersfield, $10,839.50; Byron Jackson Service Co., Bakersfield, $11,371. Contract awarded to Evans Bros., Lancaster, $7,600.

LOS ANGELES COUNTY—At the intersection of Firestone Blvd. with Studebaker Road, traffic signal system and highway lighting to be furnished and installed. District VII, Route 174, Section B. Electric and Machinery Service, Inc., South Gate, $15,217; C. D. Draucker, Inc., Los Angeles, $15,448; Fischbach and Moore, Inc., Los Angeles, $16,303. Contract awarded to Westates Electrical Construction Co., Los Angeles, $14,956.

LOS ANGELES COUNTY—In and adjacent to the City of Compton, at the intersection of Artesia Street with Alameda Street, traffic-actuated signal system and highway lighting to be furnished and installed and channelization to be constructed. District VII, Route 175, Section A. Fischbach and Moore, Inc., Los Angeles, $19,368.50; Electric and Machinery Service, Inc., South Gate, $19,762. Contract awarded to Westates Electrical Construction Co., Los Angeles, $18,965.

LOS ANGELES COUNTY—In the Cities of Redondo Beach and Manhattan Beach on Redondo Beach Blvd. between Pier Ave. and Inglewood Ave., about 1.2 miles in length, the existing pavement to be surfaced with P. M. S. and widened with P. M. S. on C. T. B. District VII, Route 175. McAmis and Baker, Gardena, $139,728; Griffith Co., Los Angeles, $144,945; Warren Southwest, Inc., Torrance, $147,207; Oswald Bros. Co., Los Angeles, $148,630. Contract awarded to J. A. Thompson and Son, Contractors, Inglewood, $131,998.50.

LOS ANGELES COUNTY—In the City of El Segundo, at the intersection of Sepulveda Blvd. with Grand Ave.; in the City of Culver City at the intersection of Sepulveda Blvd. with Lindblade St. and in the City of Inglewood, at the intersection of Centinela Ave. with Eucalyptus Ave.; traffic signal systems and highway lighting to be furnished and installed. District VII, Route 60, 158, 164, Section E. Westates Electrical Construction Co., Los Angeles, $20,502; Electric and Machinery Service, Inc., South Gate, $20,851; Fischbach and Moore, Inc., Los Angeles, $21,220. Contract awarded C. D. Draucker, Inc., Los Angeles, $19,865.

MONTEREY COUNTY—Between Chualar and Spence Underpass about 5.2 miles in length of roadside areas to be prepared and planted. District V, Route 2, Section B. Stephen L. Vistica, San Mateo, $16,530; Watkin and Sibbald, San Anselmo, $16,812; Justice-Dunn Co., Oakland, $16,920; Rudolph Watson, San Mateo, $18,095; Dana R. Tyson Co., Sacramento, $20,194; Leonard Coates Nurseries, Inc., San Jose, $26,900. Contract awarded to Huettig, Schromm, and Bennet, Inc., Palo Alto, $16,485.

RIVERSIDE COUNTY—City of Riverside, on Eighth St. between Walnut St. and Park Ave., on First St., between Main St. and Market St. and on Market St. between First St. and 14th St., traffic signal system to be furnished and installed and channelization to be constructed at two intersections and traffic signal system to be modified at 10 intersections. District VIII, Route 19, 43. Electric and Machinery Service, Inc., South Gate, $24,333; Drury Electric Co., San Bernardino, $25,512.50. Contract awarded to Fischbach and Moore, Inc., Los Angeles, $24,121.70.

SAN BERNARDINO COUNTY—In the City of Redlands at the intersection of Orange St. with Colton Ave.-Terrace Ave. Furnishing and installing traffic signal system and highway lighting. District VIII, Route 190. Fischbach and Moore, Inc., Los Angeles, $8,693; Electric and Machinery Service, Inc., South Gate, $8,785; Drury Electric Co., San Bernardino, $10,108. Contract awarded to Paul R. Gardner, Ontario, $7,726.

SAN MATEO COUNTY—At Burlingame Creek (Sanchez Creek), in the City of Burlingame the existing bridge is to be removed and replaced with a field assembled plate pipe arch and about 50 ft. in length is to be graded and surfaced with P. M. S. on C. R. B. District IV, Route 2. Minton Company, Contractors, Oakland, $28,917; The Lowrie Paving Co., Inc., San Francisco, $28,999.24; Lew Jones Construction Co., San Jose, $29,315.40; Eaton and Smith, San Francisco, $33,888.30; N. M. Saliba Co., Los Angeles, $36,000; L. C. Smith Co., San Mateo, $36,064.40; K. Scheyer, El Cerrito, $37,040; Friant Construction Co., Fresno, $37,057; Kevry Construction Co., San Leandro, $38,182; James W. Hill, Walnut Creek, $38,391.30; Edward Keeble, San Jose, $39,295; J. Henry Harris, Berkeley, $40,615.40; McGuire and Hester, Oakland, $41,877.50; Underground Construction Co., Oakland, $42,261.40. Contract awarded to Chas. S. Moore, San Jose, $25,780.20.

FOREST SERVICE CHANGES

Eugene R. Lepley, Supervisor of the Harney National Forest in South Dakota, has transferred to the California Region of the Forest Service, as the new Assistant Chief of Operation. He will take over the position now held by Jack C. Kern and Kern will replace Lepley as supervisor of the Harney. This interregional exchange of Forest Service personnel is in accordance with the service policy of varied assignments to broaden the knowledge and experience of its personnel.

Mr. and Mrs. Lepley and their two daughters have selected Fairfax, Marin County, as the location of their new home.

V. C. Martin Gets An Appointment To West Point

Vincent C. Martin, 2333 Cortez Lane, Sacramento, of the California Division of Highways was appointed to West Point on February 18th by Congressman John E. Moss of the Third District. An employee of the division since June, 1952, Martin has been serving as an under engineering aide in the Bridge Department. He formerly attended Sacramento High School and concluded three years of ROTC training there as a first lieutenant in the school battalion. One of 32 candidates for the appointment Martin will remain in state employment until July of this year, at which time he will leave for the academy.

A strapping six-footer, he hopes to play football for the Army and is seriously considering a career as a military engineer upon graduation. He knows army life from two years his family spent in Japan while his father was stationed there with occupation forces during 1948 and 1949.

TIMBER BRIDGE SURVEY

The important part played by engineered timber construction in the development of America's highways is detailed by Raymond Archibald, Chief, Western Headquarters, U. S. Bureau of Public Roads, in the new book, "Proceedings of Wood Symposium on 100 Years of Engineering Progress With Wood," just published by Timber Engineering Company, affiliate of National Lumber Manufacturers Association.

Mr. Archibald, presenting "A Survey of Timber Highway Bridges in the United States," shows how timber engineering principles were applied to highway bridges 112 years ago. Emphasis is placed on the progress resulting from developments in preservative treatments, timber connectors and laminated structural lumber.

A limited number of "Wood Symposium Proceedings" has been prepared, and single copies are available, without charge, on request to Timber Engineering Company, Dept. WS-H, 1319 18th Street, N.W., Washington 6, D. C.

COMPLIMENT FOR JERRY LIPP

Mr. Frank C. Balfour
Chief Right of Way Agent
Division of Highways

Dear Sir: I am taking this opportunity to express congratulations to your department for the able manner in which the purchasing of property for the Placerville Freeway has been carried out by your right of way agent, Mr. Jerome Lipp. I feel I speak for a large majority of Placerville residents in expressing agreement with the policies of the department and appreciation for the fair and impartial manner in which they were carried out in negotiations conducted by Mr. Lipp.

The difficulties of the terrain, sentiment, personality, and the problem of agreement on values may or may not have been more pronounced in this instance than generally are met by your people in the field; it is evident that they all were met here in a manner to do credit to and make friends for the Division of Highways.

It is heartening to see public responsibility placed in the hands of persons able to balance the load. The interests of the highway user—and taxpayer—together with that of the local property owner, I feel, were both ably represented here by Mr. Lipp with a minimum of disturbance to community life in the many necessary relocations and removals of residential and commercial properties.

Sincerely,

George Ross, *Editor*
Mountain Democrat
Placerville

MORE VEHICLES IN CALIFORNIA THAN IN ANY FOREIGN COUNTRY

California has more registered motor vehicles than any other state or any foreign country, according to a report released by the Touring Bureau of the Automobile Club of Southern California.

As of December 31, 1952, there were 5,548,642 vehicles registered. This includes automobiles, trucks, trailers and motorcycles. Not figured in this state total are 68,000 vehicles exempt from registration, such as official cars, consular service vehicles, and automobiles belonging to paraplegics.

TAKE A BOW, BALFOUR

MAY CO.
Los Angeles

February 12, 1953

Mr. Frank C. Balfour
Chief Right of Way Agent
Sacramento, California

Dear Mr. Balfour: It is with much regret that we missed seeing you before you left our city. By not being able to do it in person, we resort to this letter as the means of expressing to you our sincere appreciation for your courtesies, fair-minded considerations and most cooperative attitude in assisting in every way you can to promptly resolve the many details and problems concerning land we are endeavoring to acquire for a new store site in San Fernando Valley.

It is indeed most gratifying to come in contact with and be aware of such a competent, able public official as you have proven yourself to be in this instance. We wish to thank you very much for your fairness in evaluating our interests, yet at the same time putting the interests of the State of California first and foremost in any decisions you have made. We are looking forward to the pleasure of meeting you soon.

Most cordially yours,

(Signed) W. J. Brunmark
Vice President

REQUEST GRANTED

California Highways and Public Works
Sacramento, California

Gentlemen: I would appreciate very much your putting me on your mailing list to receive your bi-monthly publication *California Highways and Public Works.*

As a member of the City Planning Committee of the San Francisco Junior Chamber of Commerce, I am interested in highways and transportation and feel your publication would be of much benefit both to me and my committee.

Carter Norris, Jr.
Special Agent
Fidelity and Deposit Company of Maryland

EARL WARREN
Governor of California

•

FRANK B. DURKEE
Director of Public Works

•

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B. W. BOOKER . . Assistant State Highway Engineer

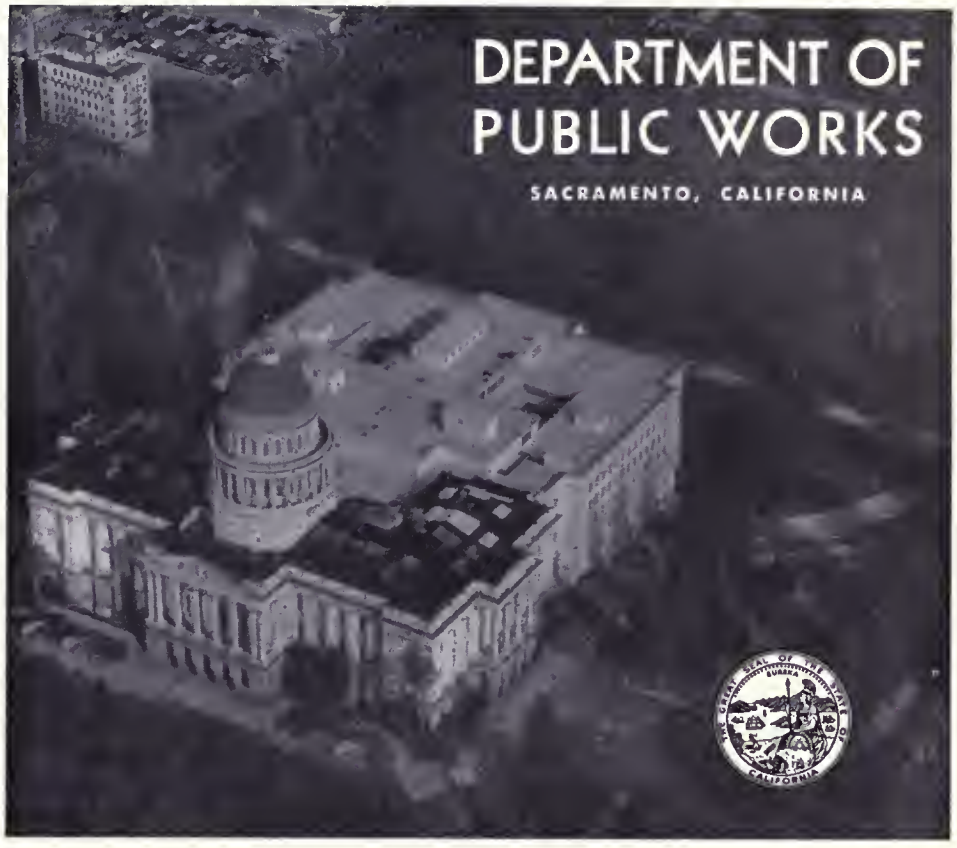
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HIGHWAYS AND PUBLIC WORKS



MAY - JUNE
1953

California Highways and Public Works

Official Journal of the Division of Highways, Department of Public Works, State of California

FRANK B. DURKEE, *Director*
GEORGE T. McCOY, *State Highway Engineer*
KENNETH C. ADAMS, *Editor*
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MERRITT R. NICKERSON, *Chief Photographer*

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NOTICE

California Highways and Public Works is mailed under permit as third class mail. Therefore it will not be forwarded by the post office to an addressee who has moved even though a request to forward has been mailed. This office should be notified promptly of any change of address.

KENNETH C. ADAMS, *Editor*
P. O. Box 1499
Sacramento, California

On-Job Training

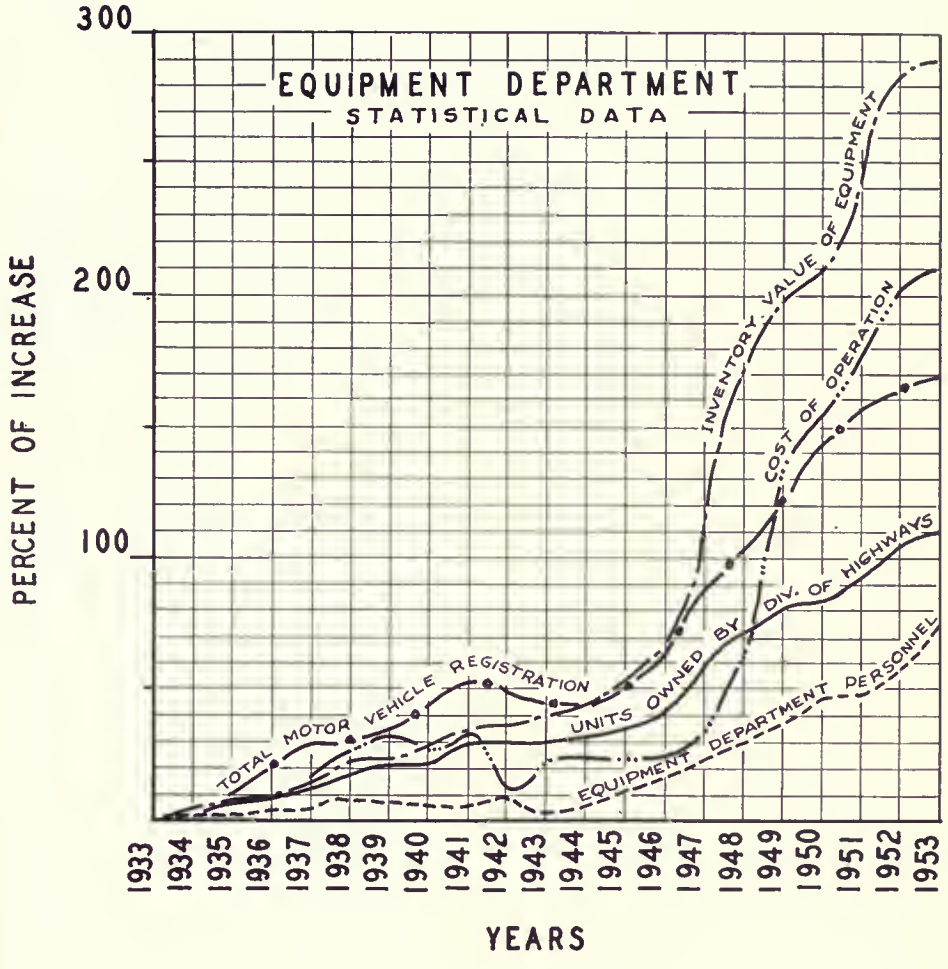
Division of Highways
Equipment Department

By EARL E. SORENSON, Equipment Engineer

THE RAPID expansion of the State Highway System in scope, complexity, and number of vehicles served is directly reflected in the increased activities and responsibilities of the Equipment Department.

The Division of Highways owns and operates approximately 6,000 units of maintenance, construction, and related equipment, with a value in excess of $18,000,000. This equipment is controlled and administered by the Equipment Department and operated by the other departments, on a rental basis, to keep the Highway System up to date and operating efficiently.

The accompanying chart illustrates graphically various statistical data related to the Equipment Department's operation, including inventory value of equipment, cost of operation, total motor vehicle registration, units owned by the Division of Highways, and Equipment Department personnel.



Vehicle Registration

The total motor vehicle registration in California has been shown for purposes of comparison. This is a reasonably accurate criterion for establishing the amount of service rendered to the public by the highway system, which, in turn, is also theoretically in proportion to the cost of maintenance of the system. Vehicle registration does not portray an entirely accurate picture, inasmuch as the expansion of the highways has admittedly not kept pace with the registration and needs. Nevertheless, these registration figures do illustrate the growth trend and the relation of this trend to the Equipment Department operations.

It is of interest to note that the various curves on the chart portray clearly the various economic periods through which we have passed. The depression period of the early 30's is indicated, then the gradual rise until the war period, when the curtailed operations are indicated by either a leveling-off or a slump in the curves.

At the conclusion of the war a gradual rise is again indicated in curves not affected by inflation, whereas those operations affected by inflation show a very abrupt increase.

It is of passing interest to note that the curves for the last year indicates a tapering-off in the inflationary trend.

Effects of Inflation

Note that the increase in personnel has not kept pace with the increase in number of units and inventory value. This is due largely to increased efficiency and productiveness of personnel, as well as improvement in equipment, and is responsible for offsetting a large portion of the inflationary effect on the cost of operation.

The upper curve, indicating inventory value of equipment, shows directly the effects of inflation. It is the abrupt rise in this curve that illustrates the need for still further preserving the large investment in our equipment and justifies the training program, outlined in this brief article, as one step toward accomplishment.

As the size, scope and financial costs of highway operation increase, the need for economies in operation and

the possibilities for effecting them also increase.

Cost Is Justified

A large organization, or operation, can justify the expenditure of more funds for research and training than one operating on a small scale. This is due to the fact that no more expense is involved in setting up an economy move in a large organization than a small one. As an example, it costs no more to seek out and remedy a faulty welding technique for all of the Equipment Department shops, than it does for only one, but the expense spread out over the larger field makes it economically feasible.

This same analysis applies to the training of Division of Highways employees, both in mechanical repairs and equipment operation. Provided sound organizational principles are used, it will cost very little more to provide equipment and personnel to train a large number of employees than it would to provide like training for a small number. We can, therefore, financially justify a centrally operated training system for taking care of all of our employees, whereas the expense would be prohibitive if duplicated in each shop.

Special Training Necessary

The above conditions, together with the fact that machines and operations have become increasingly complex with the passing years, make it almost mandatory that some specialized training be given mechanics and operators to advance their knowledge and technique so that it will be reflected in decreased cost for repairs and upkeep resulting from inadequate repairs and adjustments, and from improper operation.

With this in mind, and after thorough study and consultation, it has been decided to make available "On-the-job" training for this department, starting in a small way with the mechanics and related trades within the Equipment Department, and later, with approval and in cooperation with the Maintenance Department, making training available to their operators.

The offering of a program of this kind to adult students presents problems which require special training, experience and skill on the part of the instructors.



HILTON F. LUSK



Collapsible, universol, truck-mounted, one-man hoist. Used for maintaining high roadside and overhead structures.

Hilton F. Lusk Employed

To implement this program the Equipment Department has secured the services of Hilton F. Lusk, a man with wide and varied experience in both practical and theoretical mechanics. He has had practical experience on construction projects, both as an engineer and in operating heavy construction equipment. He holds degrees in both mechanical engineering and electrical engineering, and life teaching credentials in Vocational Arts and also in General Secondary Education.

From 1926 to 1929 Mr. Lusk was Assistant Professor of Engineering at College of the Pacific in Stockton. While at College of the Pacific, in addition to his teaching duties, he organized a Department of Aeronautics, and designed and constructed an airport adjacent to the campus, using highway construction equipment borrowed from the county.

Mr. Lusk is the author of a textbook, "General Aeronautics," published by The Ronald Press Company, of New York City, and widely used in many schools for classroom purposes.

From 1929 to 1930 he was Dean of the Boeing School of Aeronautics, at Oakland. While holding this position he selected the balance of the faculty, laid out the school building, selected the equipment, and organized the curriculum. He also taught several of the theoretical subjects.

Wide Experience

From 1930 to 1952 he was Instructor of Mechanical and Electrical Engineering at the Sacramento Junior College, where he taught courses in advanced mathematics, engineering drafting, machine design, descriptive geometry, analytical mechanics, and civil and electrical engineering.

The organizing and teaching of night school courses for mechanics, in the Sacramento Adult Evening Junior

College, for over two decades has provided him with an excellent background for handling practical instruction on the adult level.

Mr. Lusk has always been interested in gas and Diesel engines, as well as in heavy construction equipment and, in following out these interests, has held many summer jobs with large construction companies where he used his summer vacations from school to advance his knowledge in the operating technique of construction equipment.

He has been a member of the Society of Automotive Engineers for many years.

We are confident that the wide and varied training and experience of Mr. Lusk, in both theoretical and practical fields, will admirably fit him to carry on the training classes and present, to all those interested, a well-balanced program of both theoretical and practical instruction.

Since taking up his duties as Associate Equipment Engineer with this department Mr. Lusk has been assembling materials, data and equipment for use in the program. Several of the large equipment manufacturers have made available to us their libraries of instructive films and other technical data and charts which will be of great assistance.



Hydraulically controlled truck-mounted, universal, auger-type earth-drilling machine mounted on four-wheel-drive truck. Used for soil testing and subsurface exploration.



Auger-blower type snow plow. These units, mounted on four-wheel-drive truck chassis steering on all four wheels, blast the snow far to the side of the roadway.

High-speed street sweeper used to maintain long distances of freeway in immaculate condition



Manufacturers Help

Many of our problems are directly connected with certain makes and types of mechanisms and the charts, diagrams and plans needed for instruction would be costly to make. The manufacturers' willingness to supply them from their files is, therefore, appreciated, particularly in view of the fact that we will be unable to give them any publicity. Some of the larger automobile companies have offered to supply us with complete subassemblies such as automatic transmissions, special differentials, power dividers, etc.

We have also been given access to the large library of data and films maintained by the American Public Works Association.

One of our major problems is that of adequate and proper lubrication. Several of the major oil companies have made available to us large amounts of both technical and practical data, together with illustrative charts and films, covering this complicated, but much neglected, subject. The matter of lubrication will be one of the first subjects to be offered the employees and we expect to obtain much indirect benefit from a better understanding of this problem.

Accumulating Record Library

In addition to the data made available to us by outside firms, we are also planning on accumulating a library of practical and technical lectures on subjects by using our own recording devices. This will permit us to record and repeat valuable lectures by our own personnel, as well as those that may become available from technical meetings, and other like sources.

Our operations, which reach all far-flung corners and out of the way places in the State, make it impractical to bring the students in to a centralized location where proper facilities would be available. It therefore becomes necessary to literally take the school and instructors to them, and this is the premise upon which we are proceeding.

We plan on instituting some form of attendance records for those taking part in the classroom activities.

We hope by this method to see that the employee participating will receive proper credit and recognition for the interest shown.

A modern 35-foot classroom trailer has been constructed for us in Los Angeles. It is fitted with desk seats for some 18 trainees, and will be equipped with up-to-date audio-visual aids to assist the instructors.





Heavy truck-tractor and semi-trailer unit used in expediting movement of highway maintenance and emergency equipment

Self-propelled, self-feeding loader with portable crushing equipment. Used to reclaim road surfaces, using existing materials already in place.



Uniform Basic Program

Tape recording and duplicating equipment will be supplied so that lessons, demonstrations by experts, and other instructing data can be prepared on the road as the need arises, and as the material becomes available. This will permit a uniform basic training program for state-wide use.

The discussion of the application of these various aids to the program will be of much interest to many, and as our experience and knowledge progresses will be made the subject of future articles in this publication. We make this statement, for undoubtedly the instructors and personnel presenting this program will be the recipients





Hydraulically-raised truck-maunted lift, used in maintaining high voltage freeway lighting systems





Fifteen tan wrecking truck used an San Francisco-Ookland Bay Bridge handles heaviest types of disabled trucks and trailers

of valuable information on techniques brought out by this method of operation.

In order that the program may be carried out, without hindrance by climate or weather, the school trailer is equipped with both heating and cooling facilities. It will be comfortable in cold climates as well as in the desert, this in recognition of the fact that good mental work cannot be accomplished under uncomfortable physical conditions.

Truck and Trailer Unit

The trailer will be towed by a truck unit fitted with a special body equipped for safe storage of the complex and valuable equipment used. The towing unit will carry an ample-sized electric generating unit to provide electric current for operation where public utility service is not available. It will also carry many mechanical and machine parts as well as subassemblies needed for illustrative lectures and for actual practical use in instructing.

It is planned that as the unit travels from one location to another, local talent competent to present some phases of specialized training will be uncovered and used to good advantage. Often problems are peculiar to certain





Exterior and interior photos of the school trailer mobile unit

locations and their solution is understood by some of our personnel. This information can then be broadly disseminated to other employees through the use of this traveling school system.

As previously mentioned we expect to present specialized features of this program from time to time through the medium of these pages. Illustrations will be used and, if practical, lectures of general interest to employees may be presented in their entirety.

FROM NEW JERSEY

STATE HIGHWAY DEPARTMENT
R. J. Abbott, Commissioner
Trenton 1

May 15, 1953

K. C. Adams, *Editor*

Dear Sir: It has been my good fortune to occasionally secure a copy of your excellent publication. It is one of the most interesting and outstanding magazines of its type and I should appreciate it very much if I were placed on your mailing list.

Very truly yours,

State Highway Department
Ralph L. Fisher
Engineer of Design

NEW RADIO SET-UP

The new $850,000 FM radio communication set-up recently completed by the State Division of Highways is already paying for itself with interest. Although the use of the system is dramatically spotlighted during storms and emergency periods, its real money-saving value lies in normal everyday use such as ordering materials and equipment.

MANY BRIDGES POSTED

At the end of the 1951-52 Fiscal Year, 116 state highway bridges were posted for restricted load or speed, according to the State Division of Highways. New construction during the year eliminated 11 posted bridges, but nine additional postings were made necessary by the continued deterioration of some of the remaining older spans.

Cajon Pass

Reconstruction of Historic Road From Trail to Expressway

By J. DEKEMA, Assistant District Engineer, District VIII

SPRING OF 1953 marks another milepost in the development of the historic Cajon Pass from the original trail to an expressway capable of carrying thousands of high speed automobiles daily.

The first white man to have used the pass is believed to have been Pedro Fages, military Governor of California in 1772. Governor Fages trailed a group of deserters from San Diego into the Colorado Desert, but instead of turning back he continued north along the San Jacinto Mountains and discovered the San Bernardino Valley. As far as can be ascertained, he left by way of the Cajon Pass and proceeded into the Southern San Joaquin Valley, finally arriving at the San Luis Obispo Mission.

Old Indian Trail

The old Indian trail followed by later Spanish explorers crossed the San Bernardino Mountains east of the Cajon Pass on the ridge between Devil and Cable Canyon through present day Cedar Springs, and followed the Mojave River into the desert. This was the route taken by the first American to push into San Bernardino from the east. In 1826, Jedediah Smith, guided by Mojave Indians from Needles, crossed the mountains and was welcomed at the San Bernardino Asistencia, although later jailed at San Gabriel Mission. Returning the following year with another expedition, Smith used the Cajon Pass. He was again welcomed at San Bernardino and jailed at San Gabriel. The Government of Mexico in those days took a dim view of any "invasion" by Americans.

After Smith's explorations, pack trains began to wind their way from Santa Fe, New Mexico, to Southern California. The route curved far north through Colorado and Utah, then south to Las Vegas, Nevada, Tecopa, Barstow, and the Cajon Pass. One round trip a year was possible under the conditions encountered, the pack train leaving Santa Fe in the fall and returning in the spring.

Horse Thieves Active

With horses scarce and in demand in Colorado and New Mexico, it is little wonder that the vast unguarded horse herds of the California dons became the prey of organized horse-thieving expeditions in those days. The thieves used the Cajon Pass in general, but kept to the ridges and side canyons to avoid ambush. The "Horsethief Trail" has been traced through the mountains.

Mexican commerce through the pass was interrupted by the war with the United States in 1846. Soldiers of the Mormon Battalion leaving Southern California at the end of the war to return to their homes in Salt Lake showed that the use of wheeled vehicles was possible through the pass and on into Utah. Thus, the trail gradually developed into a highway.

One of the largest caravans in the history of the West left Payson, Utah, on March 24, 1851. The difficult journey came to a successful end late in June, the pioneers establishing camp at Devore and nearby Sycamore Grove. In the fall of 1851, the Mormons founded the present City of San Bernardino.

Toll Road Built

In 1861, John Brown, Sr., built a toll road from Devore to the Cajon Pass Summit under a state franchise good for 20 years. Tolls ranged from 3 cents per head of sheep to $1 for a wagon and pair of animals. The lower toll house was located at the Blue Cut, which marks the crossing of the pass

Scene showing the lower toll house just north of the Blue Cut on the Cajon Pass during the 1870's. The wagon and team of horses was charged a toll of $1. Ordinarily, it would be necessary for two teams to be used for the ascent, in which case the toll would have been $1.25.



by the great San Andreas Fault. The frequent washouts that plagued the road can be appreciated by modern maintenance men, but we wonder how our resourceful crews would respond to a repetition of the Indian attacks occurring in the early days of the road.

Roilroads Compete

At about the time that the franchise on Brown's Turnpike expired and it became a county road, the railroads were engaged in a struggle to put tracks through the pass. The Los Angeles and Independence Railroad fought off Southern Pacific forces with gun play on the West Cajon, thought at that time to be the only practical route over the pass. The Southern Pacific later bought the right to build through the Cajon when it took over the bankrupt Los Angeles and Independence Railroad, with the intention to extend its San Joaquin Valley Line to the east by way of Tehachapi, Cajon, and San Gorgonio Passes, by-passing Los Angeles completely. Meanwhile, Santa Fe officials were informed of the lower pass through the East Cajon and under the name "California Southern Extension Railway," tracks were laid from San Bernardino to Barstow, causing the Southern Pacific to run its line to Los Angeles.

When descending the pass today in a matter of a few minutes seated in comfort in automobile or train, it is difficult to realize the hardships of but a few years ago when it was necessary to dismantle wagons and lower them by ropes at the Narrows in the East Cajon.

Two Million Dollar Contract

The highway contract now being completed by Fredericksen & Kasler at a cost in excess of $2,100,000 is the southerly 9.3 miles of the pass between Devore and Gish Underpass about four miles south of the summit. About half of the old two lanes built in 1932 have been converted to use for one-way traffic, with two additional lanes constructed for traffic in the opposite direction. Four new lanes of pavement have been constructed for about five miles.

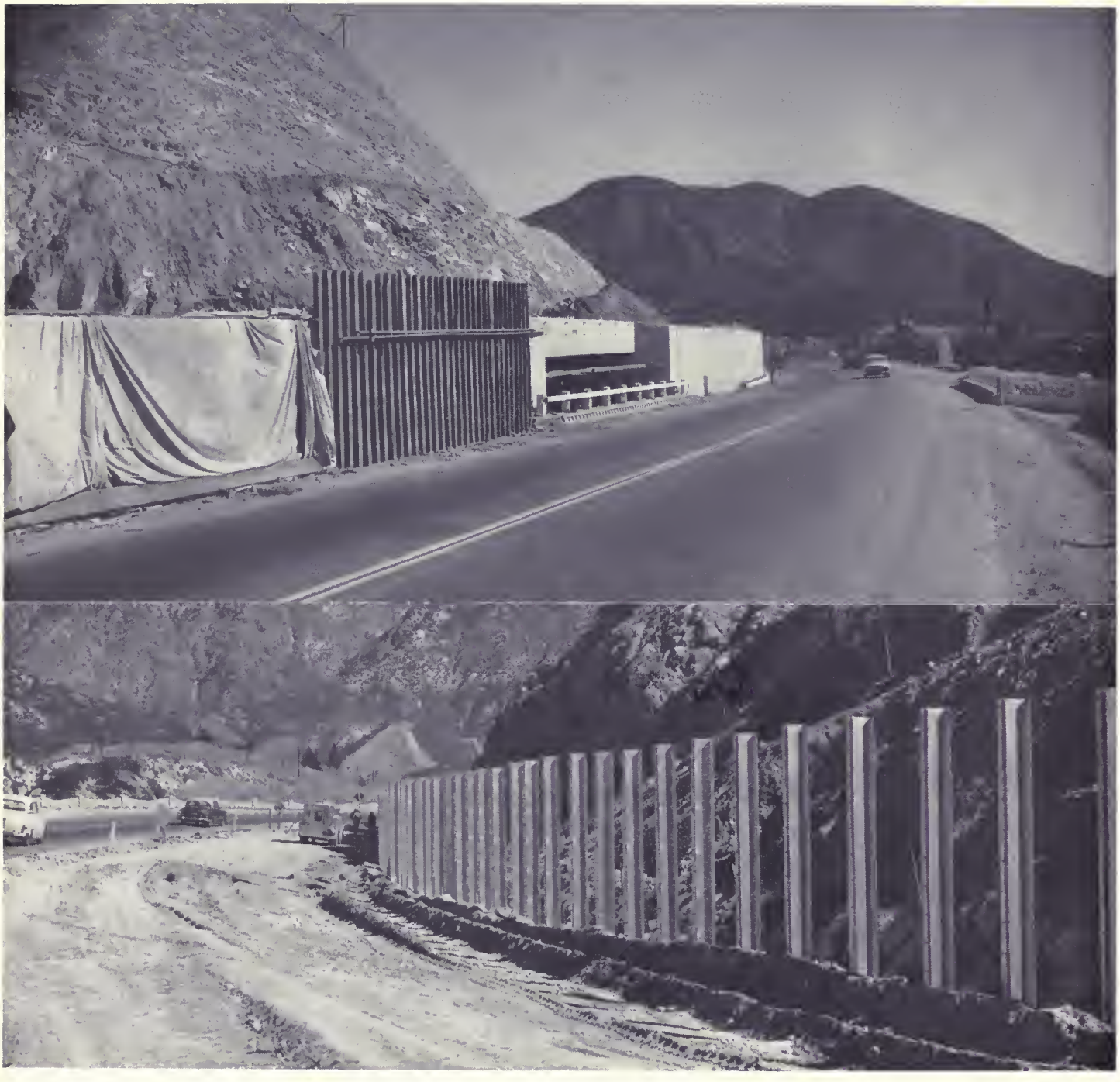
Resident Engineer J. B. MacDonald reports that the immense sand and gravel deposit near Cleghorn Creek designated in the Special Provisions as the source for base material proved to be ideal not only for the base but for mineral aggregate in plant-mixed surfacing. R-values for the base material ranged from 76-81. No cement was used. Stability of the plant-mixed surfacing with 150-200 penetration paving asphalt was usually about 40.



The contractor's aggregate production plant is shown in the left background. The entire bluff behind the plant is composed of millions of cubic yards of high quality gravel and sand.



UPPER—Typical view of completed construction, except for Class "C" seal coat. Iron Mountain and North Baldy silhouetted against sky line. CENTER—Looking uphill during construction one mile south of Cajon Station. Traffic has been diverted to the two new southbound lanes while the old road is being reconstructed to accommodate northbound traffic. Cajon Creek and the Santa Fe Railroad tracks on the left. LOWER—Truck scale installation adjacent to Blue Cut. Scale on right is the old 50-ton, 40-foot platform, while that on the left is of the new 15-ton, 10-foot single-axle platform type. This dual installation will permit weighing trucks without congesting through traffic.



UPPER—Looking south across East Fork of Cajon Creek (Horse Thief Canyon). In the right center can be seen the Mormon Trail Historical Monument. The existing road in foreground is to be used by southbound traffic. Northbound traffic will use the higher level road supported by the retaining wall shown under construction. A slide developed in the 120-foot high cut on the left during construction, and a bench had to be provided to stabilize the formation. LOWER—Construction scene at the well known Blue Cut approximately at the center of the contract. This marks the crossing of the main axis of the San Andreas Fault. H-columns in the foreground have been set in concrete foundations and together with chain link fencing to be fastened to them will serve as a debris fence to stop rocks from rolling onto pavement.

Slides Cause Trouble

Because of previous experience at the Blue Cut, present construction was around the critical area. It was years after the first big cut was made here before the slopes stabilized. Initial construction at this location in 1931-1932 was during a severe winter and an enormous slide occurred involving 100,000 cubic yards, completely blocking the new road, as well as the existing one. It became necessary to bridge Cajon Creek temporarily and route traffic over an old trail through a cattlepass under the railroad on the opposite side of the canyon and on for two miles to Cajon Station to a connection with the existing road. About 1937, a rock wall was built to catch rolling boulders and

. . . Continued on page 60

Fill Construction

Oceanside-Carlsbad Freeway Presented Interesting Problems

By G. L. RICHARDSON, Senior Highway Engineer

THE OCEANSIDE-CARLSBAD FREEWAY in District XI is rapidly nearing completion and the last unit will be finished late this year. Two sections have been completed; also the San Luis Rey River Bridge. The section between one-quarter mile south of Mission Avenue and Vista Lagoon is being paved, and grading on the final section between two and two-tenths miles south of Carlsbad to Vista Lagoon is nearly complete.

An interesting part of this project was the construction of high fills across three sloughs at Agua Hedionda, Buena Vista, and Loma Alta. Each location was of a slightly different nature and presented a different construction problem.

The southernmost slough at Agua Hedionda is open to the ocean. High tides cover the ground completely but low tide exposes large island areas which are covered with salt grass. Preliminary investigations indicated a thin stratum of mud, from zero to three feet in depth, overlaying a deep formation of fine sand.

Huge Fill Across Slough

The fill across this slough, involving 86,000 cubic yards of embankment, was 1,100 feet long and varied in height from 14 to 28 feet. A reinforced concrete slab bridge, consisting of two parallel structures 190 feet long, is being constructed at the south end of the fill.

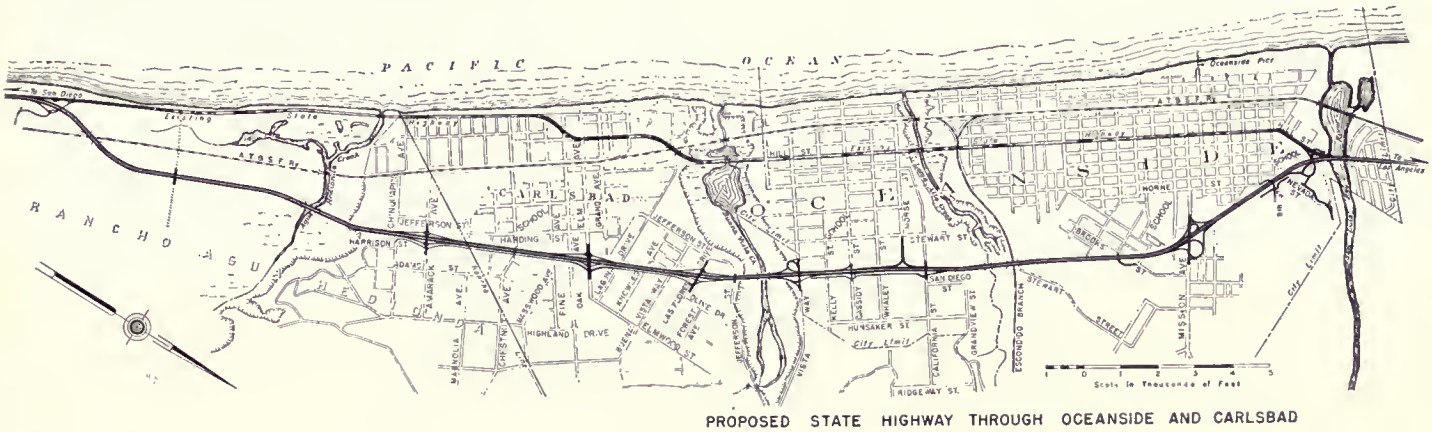


Removing unsuitable material at Buena Vista Lagoon

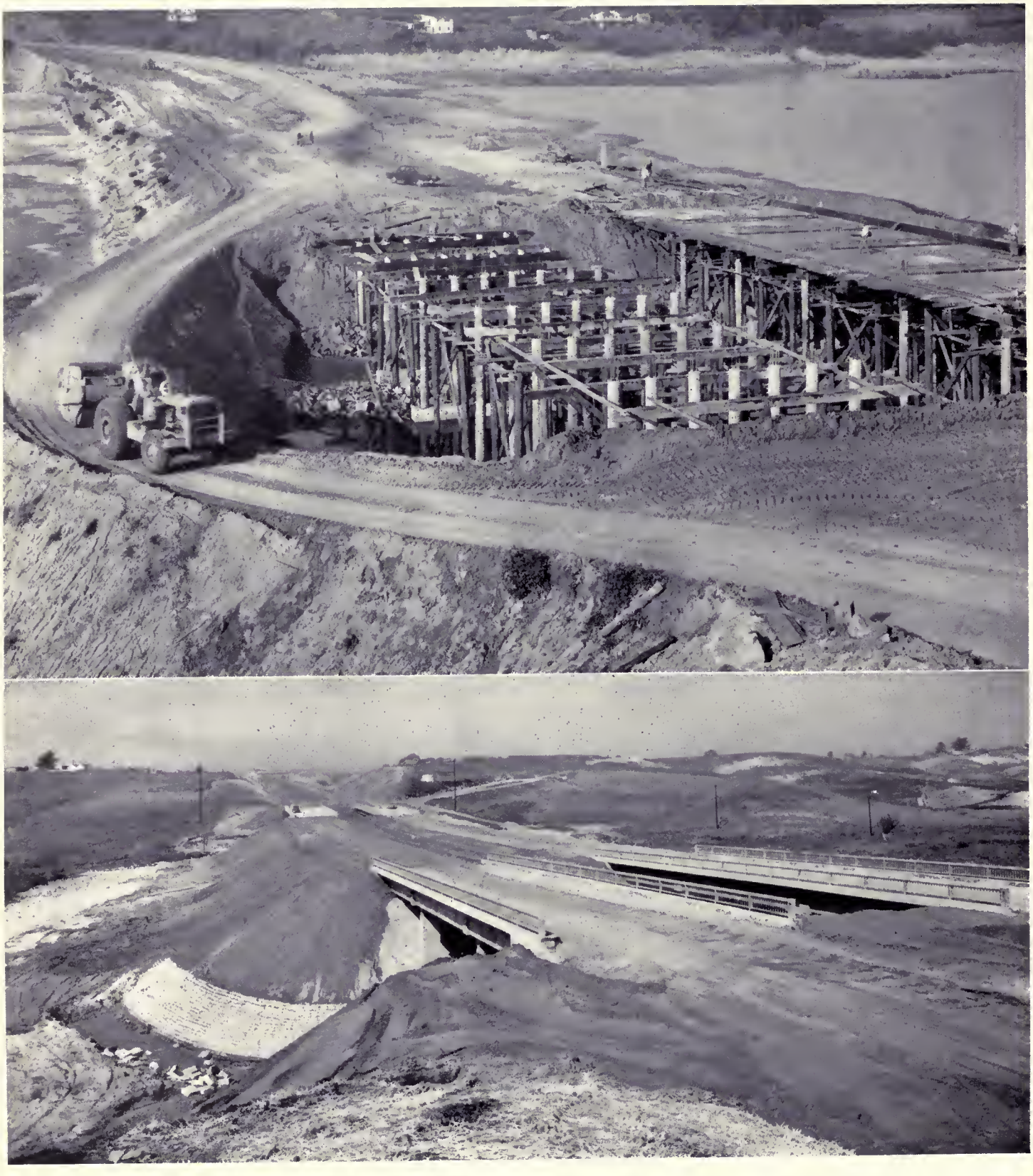
The contractor was able to remove the mud layer with a dragline and build the fill progressively out from the shore line. A blanket of sand four feet thick readily supported his equipment and in some cases was cut even thinner before starting compacting equipment. The plans called for placing a blanket of sandy material to an elevation five feet above the existing ground where unsuitable material was removed, and this was placed as specified. No surcharge was considered necessary due to the sandy nature of the foundation.

Buena Vista Lagoon

Buena Vista Lagoon is dammed at the outlet end on the ocean front with sand deposited by tides and consequently has received a heavy deposit



PROPOSED STATE HIGHWAY THROUGH OCEANSIDE AND CARLSBAD



UPPER—Bridges and fill at Agua Hedionda. LOWER—Bridges and fill at Loma Alta Creek.

of silt and mud from incoming streams. The area is covered with water approximately three feet deep for the greater part of the year. At the freeway crossing, the depth of the unsuitable material varied from two feet to seven feet and it overlayed a deposit of fine sand of undetermined depth.



UPPER—Storm droin construction. LOWER—Fill and structures at Buena Vista.

This fill contained about 191,000 cubic yards and was 1,100 feet in length and varied from 17 feet to 28 feet in height. A reinforced concrete slab bridge consists of two parallel structures, 150 feet from the south bank of the slough.

The unsuitable material was removed with draglines working from the fill as it progressed. The fill was maintained about five feet above the water level in order to support the equipment. Selected granular material was also required here to an elevation five feet above the existing ground line. After the fill was brought to rough grade, a surcharge five feet thick was placed on the portion of the fill between the south bank of the slough and the bridge. This was done in anticipation that the additional weight would accelerate the settling of this portion of the fill which was placed several months later than the northerly portion.

Loma Alta Slough

The slough at Loma Alta is considerably higher than the other two. The existing ground was dry enough to support heavy equipment and was being used as pasture land before the freeway was constructed. The 111,000-cubic-yard fill at this location was about 600 feet long and varied from 37 feet to 42 feet in height. The underlying material was composed of alternate layers of fine sand and clay, each layer being approximately two feet thick. The south end of the fill terminates in a bridge and the north end in a railroad overhead.

The contractor was able to remove the unsuitable material to an approximate depth of four feet with bulldozers. The resulting space was filled to five feet above the existing ground with a selected granular material, before constructing the embankment.

Variable Foundations

After considering the variable foundation conditions at the three sloughs, it was decided that control points should be placed to determine the amount of settlement. Metal plates with an area of approximately five square feet were installed at an elevation about two feet above the bottom of the fill. A three-quarter-inch coupling was welded to the plate to provide means of attaching three-foot lengths of pipe to the plate as the fill progressed. The plates were placed in the center dividing strips at approximately 200-foot intervals. Levels were run each time it became necessary to add pipe and at regular intervals thereafter.

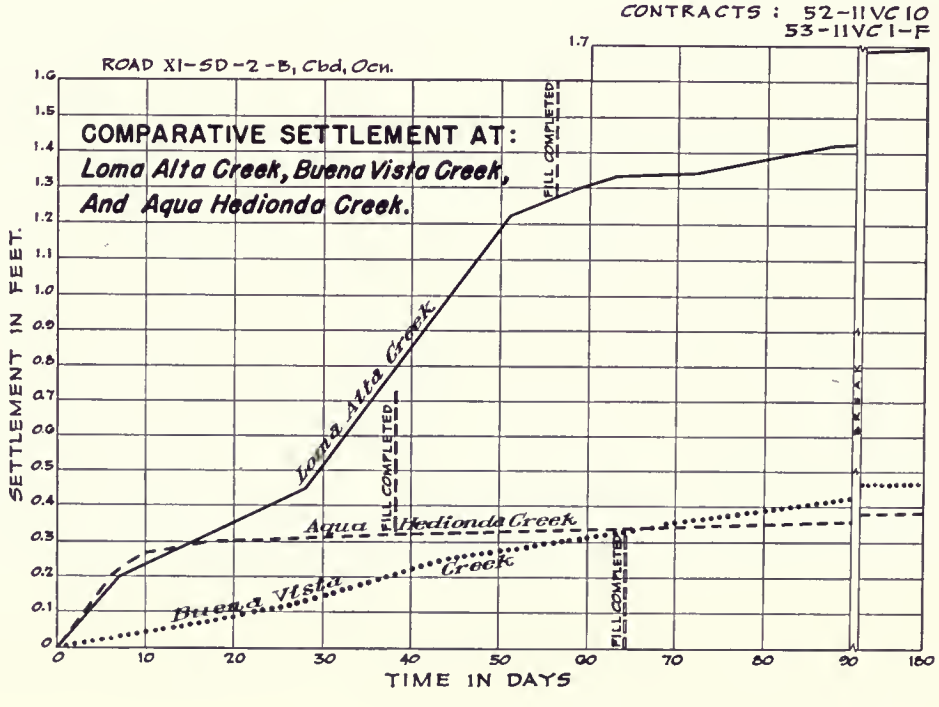
After plotting the amount of settlement against time, it was determined that very little settlement took place at Agua Hedionda or Buena Vista after the initial load was placed. At Loma Alta, settlement did continue for a longer period, reaching stability after about six months. This was probably due to movement of the underlying clay strata and to the greater fill height. All three fills have ceased to show measurable settlement in recent months.

It was anticipated that the driving of bridge piles and hauling heavy loads over the fill would accelerate settlement, but the tests run did not bear out this assumption. Due to the limited amount of surcharge work performed, results regarding acceleration of settlement were inconclusive. The accompanying chart shows the rate of settlement of a typical control point at each slough. The chart shows that the total subsidence since the start of embankment operations has been 0.4 foot for Agua Hedionda, 0.5 foot for Buena Vista and 1.7 feet for Loma Alta.

Subsurface Water

Another interesting problem was the subsurface water encountered at several locations in the Carlsbad area. As the freeway cuts were opened up, a water-bearing stratum was found from 5 to 15 feet below the surface of the original ground. The heaviest flow was found in the area just north of the Tamarack overcrossing. Here the water was evidently pocketed and under pressure, for when the excavation was first made, it flowed quite freely for several hours and from all directions, then gradually diminished to a steady flow from the northeast. The installation of perforated metal pipe backfilled with rock filter material effectively controlled the water at this location. However, when the trench for the storm drain, down the centerline of the freeway, was excavated in the same general area, additional seepage water was found coming from seams in the heavy sandy clay. As this elevation was approximately four feet below subgrade, the only remedial measure taken was to lay the reinforced concrete pipe with open joints and back fill with filter material where seepage was found. This arrangement functioned well and no indications of wet subgrade were found.

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EXAMPLE OF USE OF ANALYSIS OF VARIANCE IN INVESTIGATION OF SOME PROPERTIES OF PORTLAND CEMENT CONCRETE

By W. E. HASKELL, Associate Materials and Research Engineer

One of the fundamental problems in research on structural materials is that of measuring the effect of one or more variables factors on some physical property of the material under investigation. Theoretically the solution is very simple. It is only necessary to make a series of experiments in which some of the factors are held constant, while the others are varied over the range desired; and to measure the effect of the variables with apparatus which will detect the magnitude of the changes quantitatively and without ambiguity.

Unfortunately this theoretical ideal is never realized in actual practice. No human being can fabricate or test a specimen in identically the same manner at all times, no apparatus is completely reliable, and no factor can be held precisely constant. Since this is so, investigators must be reconciled to the hard fact that absolute precision and accuracy are both impossible of attainment. In consequence it is often observed that when the effects of variables are small, measurement data become confusing, inclusive, or uncertain, unless a method can be found by means of which the reliability of the results can be ascertained, and a valid interpretation made.

Analysis of Variance

There is a method, or statistical technique, which will do this. It is called the "analysis of variance" and was largely developed by R. A. Fisher and his colleagues at the Rothamsted Experiment Station in England. It is of comparatively recent origin, and has been extensively used in biological, agricultural and medical research. In some fields of research it has not been used as frequently as its usefulness warrants, and one of these fields is that of portland cement concrete investigation.

In this paper, an outline of the use of this valuable mathematical tool will be given by means of an actual example.

In common with all other structural materials, portland cement concrete will exhibit volume changes under certain conditions. One of the factors which will produce volume change is the absorption or loss of water from the concrete specimen or structure. If water is driven off by heat or a low relative humidity, the concrete will shrink. If water is absorbed, the concrete will expand. The magnitude of these volume changes are small, but are of considerable practical importance; and ways and means of minimizing these changes are always being sought by concrete technologists and engineers.

A Good Exomple

A part of a recent study of the volume change of concrete as effected by the addition of varying percentages of hydrated lime, affords a good example of how the analysis of variance may be employed.

In this study, test bars of portland cement concrete were fabricated and the length changes were measured when the bars had been moist cured for three days and then dried for seven days. The second measurement was made when the bars had been immersed in water for seven days, and the drying, immersion, and measurements were then alternately repeated.

The first or initial drying shrinkage is an effect of one or more variables, as is also the average change in length between the wet and dry condition, over four full cycles of wetting and drying. This latter change is known as the "moisture movement." Measurements of the initial water loss, and the corresponding water moisture movement were also made.

Series of Experiments

This series of experiments was also designed to observe the effects of two other variables in addition to the variable of added hydrated lime; namely, two types of portland cement, and three different cement contents of three, four and five sacks of cement per cubic yard of concrete. Hence there are seven possible factors which might or might not produce assignable causes of variation in the results. They are:

1. Differences between the three cement contents.
2. Differences between the two cement types.
3. Differences between the cement contents and cement types.
4. Differences between the amounts of added hydrated lime.
5. Differences between the hydrated lime content and the cement content.
6. Differences between the hydrated lime content and the cement type.
7. The residual or random test variability.

The investigator's problem is to decide upon the basis of the test measurements, which, if any of these factors are significant, and if possible, how significant.

Table No. 1 is a part of the measurement data obtained from the experiments and shows the initial drying shrinkage length changes of the test specimens, reported as a percent of their length at the three-day period.

TABLE No. 1

Type of cement	Amount of cement sacks per cubic yard	Percent of hydrated lime 0	5	10
I	3	—0.024	—0.020	—0.024
	4	—0.028	—0.022	—0.023
	5	—0.036	—0.031	—0.026
II	3	—0.019	—0.016	—0.016
	4	—0.022	—0.026	—0.027
	5	—0.030	—0.030	—0.034

TABLE No. 2

The Analysis of Variance of the Measurements Shown in Table No. 1

Item	Source of variance	Degrees of freedom	Sums of squares	Mean squares
1	Between cement contents	2	0.000388	0.000194
2	Between cement types	1	0.000011	0.000011
3	Cement contents x cement types	2	0.000038	0.000019
4	Between lime contents	2	0.000017	0.000009
5	Lime contents x cement contents	4	0.000007	0.000002
6	Lime contents x cement types	2	0.000040	0.000020
7	Residual variance	4	0.000048	0.000012
	Totals	17	0.000549	

Systematic Procedure

It is at once apparent that all of the possible real differences in these measurement values can only be revealed by means of a systematic procedure, and that some sort of a criteria or test of their reliability is essential. Both the procedure and the criteria are provided by the analysis of variance.

In brief, the analysis of variance is a mathematical operation by which the original more or less cloudy and obscure test results are transformed into a new set of values, each of which is associated with one of the seven possible causes of variation. These new values are mean squares of residuals. It is not necessary for an understanding of the paper to describe how the mean squares are computed, but these values and some others, are then arranged into a table such as that in *Table No. 2* which is the transformation of the *values in Table No. 1* arranged with respect to all of the possible variations.

The column headed "mean squares" contains the new transformed values that are associated with the causes of variation listed in the column headed "source of variance."

New Values Tested

It is now necessary to test these new values for significance by comparing them with the criteria provided by the variance analysis method. This criteria is known as Fisher's Variance Ratio (F), and is obtained by dividing the mean squares of all of the items from 1 to 6 by the mean square of Item 7, the residual variance. Testing items 3, 5, and 6 in this manner results in variance ratios of 1.58, 0.58, and 1.67.

In developing his analysis of variance, Fisher was able to calculate the distribution of the variance ratios for all degrees of freedom, at several levels of probability, and to collect these values in a table. In comparing a variance ratio obtained from experimental data, with the variance ratios in Fisher's table, the investigator first makes an assumption called a null hypothesis. Knowing that all experimental work is subject to random or unassignable causes of variation, the investigator now tentatively assumes that all of the observed variations are random ones, and that no real differences exist in his experimental results. The probability of the validity of this assumption can then be tested by reference to Fisher's tables.

Values in Fisher's Tables

The values in Fisher's tables corresponding to the degrees of freedom for Items No. 3, 4 and 5 are:

	5%	1%
For Item No. 3	6.94	18.00
For Item No. 5	6.39	15.99
For Item No. 6	6.94	18.00

The probabilities of 5 percent and 1 percent are termed "Levels of significance." In the case of Item No. 3 the specific meaning of the figures is that there is a probability of 5 in 100 or 1 in 20 that a variance ratio as high as 6.94 could be obtained if nothing but random or unassignable causes were responsible for the observed variations, and that there is a probability of 1 in 100 that a figure as high as 18.00 could occur as a result of random or chance causes. If the values of the variance ratios obtained are greater than those given in Fisher's table for the corresponding degrees of freedom, then the results would be more significant than the significance level in the table, and if lower, less significant.

Since in the above example, the calculated variance ratios are so much smaller than the ratios for the tabulated levels of significance, the investigator is justified in holding that his null hypothesis is valid, and that the three variables listed are of no significance. The mean squares for these items are therefor pooled with the residual mean squares, resulting in *Table No. 3* as shown below.

The calculated variance ratios (F) in *Table No. 3* for the remaining assignable causes of variation are obtained in the same way as heretofore, and are shown in column No. 5. Columns No. 6 and No. 7 show the corresponding ratios from Fisher's tables. From these results the investigator may now state with a very high degree of probability of being right, that the only assignable cause for the variations in the measurements of the initial drying shrinkage is due to the variable cement contents of the several concrete speciments. Neither the cement types nor the hydrated lime contents are significant so far as initial drying shrinkage is concerned.

It was stated in an earlier paragraph, that in addition to the initial length changes, other measurements were made. The variance ratios for these measurements were also computed and the results are shown in *Table No. 4.*

By means of the analysis of variance, the measurement data from *Table No. 1* and three more tables of equal size, have now been condensed in *Table No. 4.* Every figure in this table

TABLE No. 3

Analysis of Variance With Nonsignificant Interactions Pooled With the Residual Variance

Source of variance	Degrees of freedom	Sums of squares	Mean squares	Calculated F	F, from Fisher's tables 5%	1%
Between cement contents	2	0.000388	0.000194	17.64	3.88	6.93
Between cement types	1	0.000011	0.000011	1.00	4.75	9.33
Between lime contents	2	0.000017	0.000009	0.82	3.88	6.93
Residual	12	0.000133	0.000011			
Totals	17	0.000549				

TABLE No. 4

Variance Ratios of Several Properties of Portland Cement Concrete

Source of variance	Variance ratios (F) Initial drying shrinkage	Moisture movement	Initial water loss	Water moisture movement	Fisheries (F) 5%	1%
Between cement contents	17.64	2.50	15.73	37.47	3.88	6.93
Between cement types	1.00	30.50	3.45	13.59	4.75	9.33
Between lime contents	0.82	1.50	3.53	2.01	3.88	6.93

is meaningful and without ambiguity. All of the information provided by the experimental work with respect to the effect of the variable factors has been removed from the zone of conjecture or opinion and placed in the category of a probability.

A "probability" expressed as a number, is essentially different from the best kind of guess or conjecture. It has a specific meaning. A calculated probability is actual knowledge, not a belief, an opinion, or a hypothesis. It is the relationship of a conclusion and the evidence upon which the conclusion is based.

Calculated Variance Ratio

In *Table No. 4* the figure of 17.64 is the calculated variance ratio between cement contents based on the experimental data. The figure 6.93 is the corresponding 1 percent level of significance figure from Fisher's tables. Referring to these figures it can be stated that there is only a probability of 1 percent or one chance in 100 that a variance ratio greater than 6.93 would be obtained in the experiments purely as a result of chance or unassignable causes. The calculated variance ratio of 17.64 is associated with the "between cement contents" of the experiment and is much larger than the tabulated variance ratio of 6.93.

Hence a null hypothesis stating that different cement contents produce *no* effect on drying shrinkage is invalidated by the calculated variance ratio.

This invalidation of the null hypothesis is equivalent to a statement of the converse hypothesis—that the different cement contents *do* produce an effect on drying shrinkage—and this assertion is confirmed by the large variance ratio. For all practical purposes this high probability might well be called a certainty. It is the final conclusion that can be drawn from the data.

When a variance ratio is either very high or very low, the conclusions are easily made. In the event of an inconclusive ratio, the investigator must repeat the experimental work or devise improvements in his experimental technique. In any case the analysis of variance is the most rational method that can be used in interpreting experimental data.

The statistical approach is particularly satisfying to the engineer inasmuch as it permits the condensation of a great deal of measurement data into a few unequivocal indices, and eliminates the inherent uncertainties of experimental work insofar as they can be eliminated.

In recent years there has been a steady increase in the use of all kinds of statistical methodology in widely dissimilar fields. In the field of portland cement concrete studies, it would seem safe to predict that some of these techniques, including the analysis of variance will play an increasingly important role.

The basic installation of the new high-frequency FM radio system has been completed in all 11 state highway districts as well as on the San Francisco-Oakland Bay Bridge, according to the California Division of Highways. There are now in operation throughout the State, 75 base stations, 27 control stations, 28 fixed relay stations and 550 radio-equipped cars and trucks.

During the 1951-52 Fiscal Year the Pavement Section of the Materials and Research Department in the Division of Highways has performed a total of 88,000 individual tests on 9,700 samples of highway material. During the same period the Chemical Laboratory made some 20,000 tests on 25 different kinds of material including nearly 19,000,000 pounds of corrugated metal pipe.

Salute to Road Workers

"ROADWORK. Speed Limit 25 Miles." How often have motorists maligned the maintenance men who set out signs with that legend along the highways! And on some occasions it must be admitted their complaints are justified—the signs are placed an unnecessarily long distance from the work, or are left up while workers attend to other duties. There is reason for impatience in such cases.

Yet no better friends of those who drive are to be found anywhere than these same maintenance men.

Highways are never really finished. No sooner are they opened than the work of upkeep must begin. There are always wear and tear, wind and weather, plantings to be made and signs to be replaced.

The maintenance men are the ones who perform this unending task. They operate the snowplows, clear the debris-choked drains, remove the slides and set up the warnings. To them, as the records will show, hours mean little when a road must be kept clear of snow, or reopened after a blizzard.

Perhaps you've seen them out with flags and lanterns in the rain to caution you of a slide ahead, or floodwater on a road, a bridge out or a detour too new to be identified by a sign.

So next time you see a "road work" sign, even if it seems unnecessary, do not become impatient with the maintenance men. Round the clock and round the year, they do a lot to make the highways safer and more convenient for you and your family—*Motorland, May, 1953.*

A total of 30,703,245 vehicles crossed the San Francisco-Oakland Bay Bridge during the 1951-52 Fiscal Year to establish a new record for vehicular traffic over the bridge, the recent Annual Report of the State Division of Highways reveals. The new record represents a gain of nearly 3½ percent over the 29,672,520 of the preceding year. Average daily traffic for the year was 83,889.

Dunsmuir to Big Canyon

By F. E. BAXTER
Assistant District Engineer

Work Goes Forward After Winter Shutdown

THE SEPTEMBER-OCTOBER, 1951, issue of the *Highways and Public Works* magazine included an article entitled "Footpaths to Freeway" in which future plans for the improvement of U. S. 99 in Siskiyou County were discussed.

Since that time, the first unit of this work has been undertaken with the awarding to A. Teichert & Son, Sacramento, of a contract for the grading and paving of 4.3 miles of highway between Dunsmuir and Big Canyon (II-Sis-3-A), Contract 53-2TC2-F).

The early road builders in this area who, in 1860, first developed a stage road from Yreka in northern Siskiyou County to Upper Soda Springs, which lies within the limits of the present project, undoubtedly encountered many of the same problems which are prevalent today in endeavoring to construct this modern freeway-type of roadway through this historic area wherein are found many springs and watering places which in earlier times helped to make this area function as a rendezvous for the Hudson Bay Company trappers and the Indians of the area.

Winter Shutdown

The contractor has diligently pursued the grading work on this project. The work started on May 13, 1952, and the bulldozers and scrapers and shovels were hard at it until inclement winter weather forced a shutdown of all operations in the early part of December of 1952. The construction of drainage structures and the grading occupied the major effort during this period.

Many seepages and springs were uncovered as the work progressed. In several instances the design slopes of the cuts were found to be too steep to withstand the wet conditions which prevailed after the cuts had been opened and the springs were uncovered. Many feet of cut slopes had to be laid back to a flatter slope (a 1: 1 slope was flattened to 3: 1 in one instance) and hundreds of feet of addi-

View of present Sacramento River Bridge at north entrance to Dunsmuir





UPPER—Partially completed grade. New construction will eliminate present road at left. LOWER—Partially completed grade. Dunsmuir in background.



tional perforated metal pipe drains were used to drain the encountered water from fill and cut areas.

Slides Interfere

Slides resulting from springs and water saturation of soil have caused an approximate 25 percent increase in roadway quantities and an approximate 100 percent increase in the use of perforated metal pipe drains.

During the winter shutdown, on January 8th and 9th of 1953 a warm rain succeeded in melting a two-foot depth of snow pack on the surrounding area. The resultant concentrated runoff caused the flooding of the parallel existing highway in four different places and resulted in washing out many of the partially completed drainage facilities. However, the contractor's forces, with the help of the state maintenance crews, succeeded in diverting this water before serious damage to the roadbed or adjacent residences could result.

Completion This Fall

Work was resumed on the project after the winter shutdown in the early part of April and it is expected the job will be completed in the fall. Surfacing will consist of a bituminous plant mix over a cement-treated base course.

A. H. Bauer is superintendent for the contractor and R. J. Wilson is the State's Resident Engineer under J. W. Trask, District Engineer.

The next step in the development of this historic highway to present-day standards will be the widening of the Sacramento River Bridge at the south limits of the present grading and surfacing contract and the construction of the south approach to the bridge from Spring Street in the City of Dunsmuir. The bridge is to be widened by the construction of a new span on the upstream side of the present bridge and the deck of the existing bridge will be double-decked to raise the grade approximately two feet to meet the grade of the new span and the new approaches, thus improving the grade rate for the whole project.

Plans for the new bridge and approach work are now complete and the work is to be advertised in the near future.

As can be observed from the accompanying photographs, the need for more roadway capacity at the north entrance to Dunsmuir is very obvious.

Congested condition at Sacramento River Bridge. New grade can be seen in the right background.



An Explanation

Why Maintenance Work Must Be Done in Summer

Those state maintenance crews and their equipment which you encounter along the highways and which sometimes hold you up from getting to your favorite recreation spot on schedule are not placed there by the Division of Highways to make it tough for you.

They, like you, are the victims of circumstance, for the old saying that oil and water don't mix was never truer than in the case of maintaining the more than 14,000 miles of state highways in California.

It's a sad but inescapable fact that highway repairs cannot be accomplished during cold, wet weather.

And to California's 5,700,000 licensed drivers, this means that on many stretches of highway, the three- or four-month period when vacation travel is at its peak, is the only time when the state crews can repair last winter's damage and keep the highway in shape for use.

Summer Work Extensive

Each year, some 2,000 miles of road repair work must be done during the summer months.

Except for emergency situations, a road resurfaced during cold, damp weather is money down the drain. Without warm temperatures and drying sun, road materials will not fuse properly and will go to pieces in short order under heavy and fast moving traffic.

A large portion of the Division of Highways' woes occur in the northern part of the State, where an increasing number of heavy trucks must use highways designed and built for traffic of 20 years ago. Add to this heavy rainfall and snows, plus freezing and thawing action, and a situation develops that would be tough on even a modern road. To keep these roads from breaking up completely a lot of work must be done on them during the vacation season.

And where 10 years ago a 15-minute delay on a typical mountain highway might stop a dozen cars, it is not infrequent for such a delay now to hold up many more. After all, California has nearly doubled its motor vehicle registration in the last decade.

Tough Job Last Year

The weather has not always been cooperative, either. During the 12 months between July 1, 1951, and June 30th of last year the division's Maintenance Department experienced one of the most difficult years in its history. This was partly due to the increasing traffic, but the main stress came from meeting the many emergencies caused by one of the longest and severest winter seasons on record.

Snow removal alone in the 1951-52 winter season cost more than $2,445,000, against less than a million for average years in the past. Resulting damage to roads was extensive, requiring a greater amount of work during last summer to get them back into shape.

All these factors have contributed to making the maintenance of California's state highways the huge project that it is, currently costing $23,000,000 a year and requiring the services of nearly 2,500 people, including engineers, equipment operators, mechanics and many other workers.

ROADSIDE CLEANUP CAMPAIGN LAUNCHED

California's roadsides will be free of paper, bottles and cans this summer, provided the public will practice the same good housekeeping in its cars as it does at home, according to the Travel and Recreation Committee of the State Chamber of Commerce.

Meeting in San Francisco, representatives of the California Federation of Women's Clubs, Congress of Parents and Teachers, California Garden Clubs, California Roadside Council, Boy Scouts of America, and business interests whose containers are thrown from passing cars perfected plans to "Keep Our Roadsides Clean."

The plan, as summed up by Joseph R. Knowland, Chairman of the Statewide Travel and Recreation Committee, is simple. "We believe," said Mr. Knowland, "that the habit of tossing litter from the cars, which has been responsible for the unsightly condition of our roadsides, has been due mostly to thoughtlessness. We are asking the motoring public to join with us in practicing the same good housekeeping in its cars as it does at home. At home people use their grocery bags in which to deposit garbage and other refuse and then transfer them to the proper receptacle. Used grocery bags should also be carried in the car for depositing wrappers, tissue, lunch remains, bottles and cans, and finally should be disposed of in a proper trash receptacle along the highway, at one of the roadside services, or carried home."

Mrs. C. K. Schnabel, Secretary, California Federation of Women's Clubs, reported that resolutions backing up such a cleanup campaign had been passed by her organization. Mrs. John O. England, representing National and California State Garden Clubs, reported that a "Don't Be a Litterbug" campaign is part of their national program.

Mrs. Ralph Reynolds of the California Roadside Council said that members of her organization had been notified of official endorsement of the campaign by the group and would make plans to cooperate with local chambers of commerce in carrying it out.

Mrs. George Beanston, reporting for the California Congress of Parents and Teachers, advised that this organization is making the campaign a part of their program and that they will contact the schools in order to secure the cooperation of teachers and students.

Experience Report

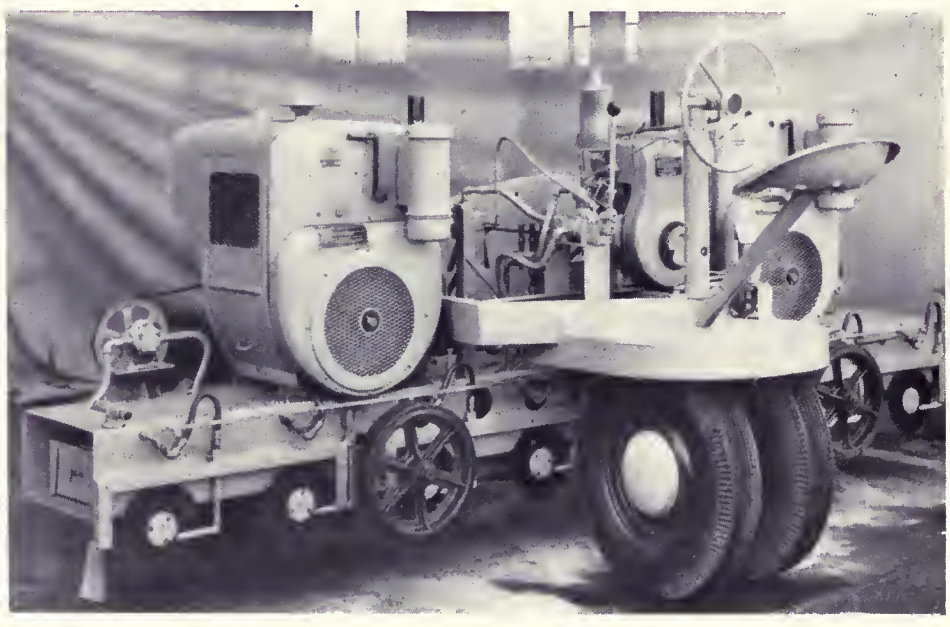
On Sawing Weakened Plane Contraction Joint in Pavement

BY D. G. EVANS, Construction Engineer

Late in 1952, the California Division of Highways began sawing the weakened plane joint in concrete pavement and to date nearly 260,000 lineal feet of these joints have been sawed on five paving projects. In this relatively new procedure the groove to form the weakened plane contraction joint is sawed by diamond rimmed blades after the concrete has hardened.

Projects constructed so far have been largely of an experimental nature and while some recommendations can be made at this time, no definite sawing procedure has been decided upon as yet. Joints constructed appear to be superior to the premolded paper strip type of weakened plane joint specified in the past. Several short sections of concrete pavements were placed in 1947 and 1948 in which the contraction joints were sawed; recent observation of these joints disclosed the excellent performance of this type of construction. The sawed joint is at present, however, a more expensive joint and under certain conditions numerous random cracks have appeared in the pavement as a result of its use.

The high costs and many of the uncontrolled cracks may well be characteristic of any new operation with its untrained operators and inspectors as well as unproven equipment.





Multiple-bloded mochines used recently to saw joints in concrete pavements

Equipment

Contractors have supplied two general types of equipment for use in sawing pavement concrete, the single-bladed machine and the multiple-bladed machine. Both types are capable of sawing an equal quality joint but the advantages of each are still somewhat controversial.

Single-bladed Machine

This type of concrete saw consists primarily of a compact gasoline engine mounted on a four-wheel carriage balanced so that it can be easily moved from one location to another. Generally the power unit is used to drive the cutting spindle and the machine must be propelled by the operator. Originally designed for other types of concrete sawing, the single-bladed machines are adaptable to constructing pavement joints. This type of equipment is manually guided and requires a chalk line for proper joint alignment. Speed of sawing varies from 1½ feet to 4 feet of 2-inch depth joint per minute, depending on the age and character of the concrete.

Multiple-bladed Machine

The multiple-bladed concrete saw has been especially developed to saw transverse joints in pavement concrete.

The machine is mechanically propelled along the pavement and the cutting carriage is power-driven transversely across the pavement at a constant rate on guide rails or wheels. Separate power units are provided for each of these operations. The cutting carriage is equipped with two or more blades placed in tandem.

The cutting cycle requires from three to five minutes per joint which in turn will require one to two shifts per day to keep abreast of an average day's run of the mixer.

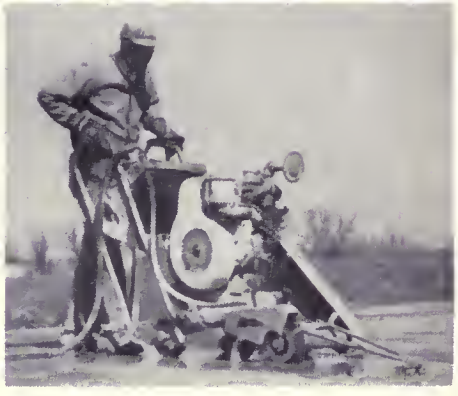
Both types of machines feature a water-spray system for cooling the blade and lubricating the cutting. The saw blades revolve at approximately 3,300 r.p.m. and ample quantities of water are necessary to protect the expensive diamond set blades. For large scale sawing it is necessary to provide an auxiliary water truck to supply the large quantities of water needed. An inadequate water supply will result in lower blade footage and in the more extreme cases a warped blade. Normally, a crew of two men is necessary, one to operate the saw and the other to mark the joint alignment where necessary and to move the water truck.

Segmented diamond-rimmed saw blades used to saw concrete. These blades are good for about 800 feet of two-inch groove.





Single-bladed machines used recently to saw highway concrete



Saw Blade

The concrete saw blades now in use for joint sawing are 10- and 12-inch diameter segmented circular steel disks with diamond cutting edges. The saw blade is a high-grade steel and the cutting edge is set with commercial-grade diamonds.

The groove made in the concrete by the saw varies from around three thirty-seconds inch to three-sixteenths inch, the variation being due to the condition of the blade, and the age of the concrete. Ordinarily, new blades cutting green concrete produce the widest cuts, while cuts by worn blades in hardened concrete result in the narrow sharp-edge grooves.

Prices currently being quoted for the concrete saw blade at the retail level are $130 for the 10-inch size and $150 for the 12-inch size.

Footages obtained from these blades have varied greatly. On one project an average of 450 lineal feet of 2-inch groove was obtained per blade; on another, the average was nearly 850 linear feet. It now appears that 800 to 850 lineal feet may be reasonably expected from each blade with present equipment and sawing procedure.

Factors Influencing Blade Wear

(1) Age of concrete.

More footage will be obtained with blades cutting hardened concrete than green concrete. Sand particles work loose when the concrete is green and the increased abrasion decreases the blade life.

(2) Type of aggregate.

Footage that can be obtained with each blade is in direct proportion to the hardness of the coarse aggregate used in the concrete. The State of Washington reports footages of 700 linear feet per blade sawing aggregate of basaltic nature, while the midwestern states have cut 2,000 to 3,000 feet of concrete having limestone aggregate. However, with the various California aggregates not much difference in blade footage is anticipated on that account.

The contractors' men must become familiar with the specialized equipment used in sawing concrete. Failure of the water supply, for example, may ruin a blade or a set of blades in a

few seconds. An excessive rate of sawing also reduces blade life considerably.

Costs

The cost of sawing joints is directly related to the type of aggregate used, the time at which the concrete is sawed, the efficiency of the operation of the saw, and the rate of sawing.

The depth of cut is necessarily another item to be considered. To date, joints have been sawed to a depth of 2 inches, but in an effort to reduce costs several test sections of 1½-inch joints have been placed. From these sections, it appears that a 1½-inch groove is effective in producing a weakened plane and in several future contracts this depth cut will be specified. The blade life is not directly proportional to the depth of cut and only a 10 to 15 percent reduction in sawing costs is expected as a result of this shallower groove.

The unit costs, based on an assumed production of 800 cubic yards of paving concrete per day, 850 lineal feet of 2-inch joint per blade, an operating crew of two men per shift and two shifts per day, equipment rental of $4 per hour for water truck and 2 cents per lineal foot of joint for the machine, would be approximately 75 cents per cubic yard of concrete or 27 cents per lineal foot of joint. Analyzing this cost further:

Items	*Cost/L.F.*	*Percent*
Blades	$0.17	63
Labor	0.05	19
Equipment	0.05	18

It should be noted from this analysis that the bulk of the cost of sawing is in blade wear and any savings in this item will materially reduce the overall cost. Presumably a 1½-inch depth cut would average out at around 24 cents per lineal foot.

Basic Factors

When the concrete is first placed on the grade it begins to undergo several chemical and physical changes that result in a slight but important decrease in volume. This decrease in volume is due to:

(1) Loss of mixing water. (Drying shrinkage.)

(2) Temperature drop. (Due to atmospheric temperature changes and loss of heat of hydration.)



Typical random crack in componion lane. Random crack was present before groove was sawed.

(3) Hardening of the cement paste. (Hardening shrinkage.)

The decrease in volume, if uncontrolled, will result in initial transverse random shrinkage cracks at intervals of 60 to 90 feet. If weakened planes are constructed in the pavement, the concrete will crack directly at these plane locations and form a regular transverse opening called a contraction joint. Whereas the random shrinkage crack will spall under the action of traffic due to its irregularity, the straight well-constructed contraction joint that occurs at a weakened plane is spall-free.

Weakened plane contraction joints had previously been formed by a 2-inch premolded paper strip placed in the fresh concrete. These joints, while economical, were difficult to maintain in the proper position during the finishing operation, which later often resulted in severe spalling. Nevertheless, this paper insert did have the advantage of being in position when the initial shrinkage began and this had the direct effect of controlling the first shrinkage cracks.

Construction Procedure

In making the initial transverse control cuts to prevent random cracking of the slab, it is necessary to wait until the concrete hardens sufficiently to permit sawing without tearing and yet saw the groove before uncontrolled random cracking occurs. It is only necessary to cut the 60-foot joints (or control joints) to control the early shrinkage and once these are cut the stress is relieved and no further cracking should be experienced within a reasonable length of time. The intermediate joints may then be cut 24 or 48 hours later when a better joint will be obtained at a lower cost.

The time at which the control joints should be cut varies greatly and in general is directly related to climatic conditions. Physical and chemical composition of cements and water-cement ratios are undoubtedly influencing factors of a secondary nature.

It has been found that the time at which the control cuts must be made will vary from seven hours on a hot day to 26 hours in cool, foggy weather. The sawing operation of these control joints might be compared to the concrete finishing operation, as there exists only a certain period in which the work can be done. Trained operators can usually determine the proper time for sawing after a few trial cuts. Generally, it has been found that some raveling must accompany the sawing of the control joints, for if a neat sharp-edged joint is obtained, the concrete has hardened to a point where shrinkage stresses probably have already resulted in random cracks, though they may be difficult to see. If a slight raveling and water rounding of the joint occurs, it indicates that the concrete has not yet hardened sufficiently to result in damaging shrinkage stresses.

Since loss of the excess mixing water (over that required for hydration of the cement) is one of the major sources of early shrinkage, delaying this water loss will also delay tensile stresses in the concrete and allow more time in which to cut the weakened plane. This is particularly true of the initial lane. Continued heavy fogging of the fresh concrete until the final curing operation gets under way will

aid in this respect. Of course, that portion of the volume change due to hardening and the temperature variation will be uncontrollable. Large variations in temperatures between day and night, together with low humidity and high winds, appear to be the most difficult in which to control random cracking. As for any individual day, the greatest number of random cracks have occurred in that part of the day's pour which had been completed before noon. It is this portion that hardens quickly and which must be watched closely. The afternoon's pour sets slowly and there appears to be considerable time in which to cut these control joints. In this respect, the State of Colorado reports similar experiences.

Any joint that has opened in the initial lane must be matched by a control joint in the companion lane. This is very important, since if it is not done a random crack across the second lane will invariably result. When pouring the second lane, it is necessary to mark all joints that have opened in the first lane so as to know which joints are critical. It has been found that the best system is to have a man paint in the morning each joint that has opened in the first lane. The opened joints are widest at this time and most easily detected.

The sawing of the control joints in the companion lane is more critical as to timing, and under certain conditions it will be impossible to cut the pavement before a random crack occurs.

The critical nature of the companion lane stems from the fact that in addition to the normal shrinkage stresses of the concrete, the initial lane transmits through the tie-bolt assemblies to the companion lane additional volume change stresses. At times, the initial lane will transmit enough stress to the second lane to result in a random crack before the concrete has set hard enough in the latter to permit sawing. When it is evident that this is happening, it will be necessary to start inserting premolded paper strips to form the control joints.

Diagonal and Normal Joint Construction

Contraction joints have been sawed both normal and diagonal to the center line of the pavement. Under certain conditions, the diagonal joint has proven more difficult to saw and has resulted in a more serious random crack pattern. As a result, it is recommended that the diagonal joint not be specified until the sawing technique has been better perfected and construction personnel become better acquainted with the operation.



Typical intermediate sawed contraction joint. These joints will not be sealed.

General

Based on field observations of the experimental sections placed in 1947 and 1948, as well as of the more recently constructed projects, the following advantages are apparent at present in the sawed joint over the premolded paper weakened plane contraction joint:

(1) The sawed joint insures a groove that is vertical and straight which is surrounded by a concrete that is of equal quality to that found elsewhere in the pavement. There is less spalling at the joints with the result that a better riding pavement is obtained.

(2) The narrow groove of the sawed contraction joint is not noticeable at average driving speeds and the pavement appears as a continuous white ribbon.

(3) The sawed joint permits a better sequence of operation of the concrete finishing equipment train. The operation of the Johnson float is simplified since there are no paper strips to "roll" or "pull" and extra passes of the float are eliminated.

FROM INDIANA

STATE OF INDIANA
Director of Traffic Safety
Indianapolis 4, Indiana

California Highways and Public Works

GENTLEMEN: The State of Indiana has recently established a Department of Traffic Safety, which will be charged with the responsibility of developing and conducting a statewide program designed to reduce traffic deaths and injuries.

To assist us in this endeavor, it would be appreciated if my office could be placed on your mailing list for *California Highways and Public Works.*

With thanks for your cooperation, I am

Sincerely yours,

J. L. LINGO
Director of Traffic Safety

Merit Awards Are Given

MERIT AWARDS for employee suggestions granted by the Merit Award Board were presented to Lloyd B. Reynolds, Associate Highway Engineer, and to Sam Lunetta, Supervising Blueprinter in the Service and Supply Department, by Assistant State Highway Engineer Richard H. Wilson on May 22d.

Reynolds received a check for $25 for his suggestion that data on contract statistics to be included in the annual report of the Division of Highways be recorded on individual sheets in loose form. Lunetta was given a check for $10 for his idea of a roll-up device used in connection with the exposure of autopositive film.

DEATH VALLEY ATTRACTS CAMERA ENTHUSIASTS



TWO DIFFERENT VIEWS OF SCENES IN DEATH VALLEY

LEFT: A view of wind eroded rocks seen from Artist's Canyon. The wind eroded rocks, with different colored strata, is one of the scenic views from this canyon.

RIGHT: A cathedral like rock at the head of the canyon called Natural Bridge. This inspiring pile rises above all else at the end of this canyon.

U. C. Professors Offer a Revised Edition of Book

A REVISED EDITION of "Surveying Theory and Practice" by Raymond E. Davis, Professor of Civil Engineering, and Francis S. Foote, Professor of Railroad Engineering, University of California, is just off the press of McGraw-Hill Book Company, Inc., New York.

Divided essentially into three parts, the book covers fundamental relationships and techniques, operations common to all branches of surveying, such as measuring and plotting angles and distances, and the practice of surveying as extended to entire surveys. The book's revision includes rewriting of many sections such as those on errors, field astronomy, photogrammetric surveying, barometric leveling, index error of the transit, strength of triangulation figure, geodetic leveling, planimeter, vertical curves, adjustment of compass traverses, state systems of plane coordinates, three-point problem, plotting details, and specifications for topographic maps. These changes afford greater clarity, simplicity, and intelligibility.

The authors have added new advances in the inclusion of discussions on recently developed sensitive barometers, new European types of transit and level. Further, summary tables of error in chaining and in leveling are given, and tabulation of systematic procedure for taking side shots with the plane table is presented. For clarification of adjustment of level and transit, line diagrams show desired relationships between principal lines of instruments. Applications of photogrammetry in route surveying are newly discussed. And there are many more noteworthy brief additions.

Gaviota Tunnel

Last Section of Lining Placed, Portals Finished

By JOHN E. WITTE, Resident Engineer

With the placing of the last section of reinforced concrete tunnel lining, completion of the pavement, and construction of the portal structures, Gaviota Gorge Tunnel on U. S. 101 all field work in connection with construction of the project was completed on May 13th. The tunnel, which is 435 feet long between portals, is a portion of the planned limited access freeway between Gaviota and one mile north of Najoqui Summit, in Santa Barbara County, a distance of approximately 8.3 miles. The work on the entire section was begun in May, 1950, and is scheduled for completion in the fall of 1953 at an estimated cost of $3,300,000.

The history and geology of the area were discussed together with an account of the driving of the tunnel in the January-February, 1953, issue of the *California Highways and Public Works* magazine.

The completed tunnel will accomodate two traffic lanes 12 feet in width with combination sidewalks, curbs, and two-foot gutters. It is on a 1,200-foot radius curve and a plus 4.47 percent grade with the roadway section superelevated 10 percent to provide for the design speed of 60 miles per hour.

The Portland cement concrete tunnel lining is 18 inches thick in the cut and cover section of the tunnel, 24 inches thick in the steel supported section and 36 inches thick in the timber supported section.

Tunnel Lining Form

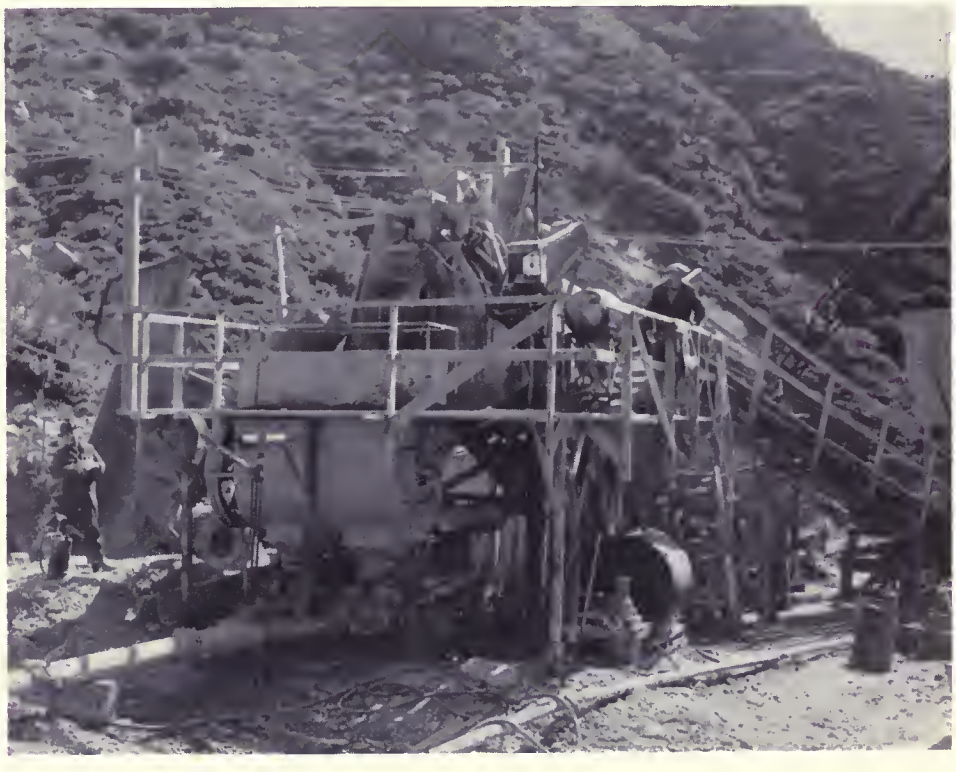
In order to secure the desired continuity in the surface of the tunnel lining the specifications limited the lining form to a length of 16 feet. With the over-all dimensions of the form specified by the plans, the dimensions of the structural members of the form were designed from a stress analysis which considered not only the total load of the wet concrete imposed on the form during the placing of the lining but also the rate of pour and the temperature of the concrete at the time of placing.

The steel lining form used was designed by William H. Schutte for the contractor, Rhoades-Shofner Construction Company of Los Angeles. The form consists of a crown section and two side panel sections mounted on a gantry frame and supported by gantry trucks composed of 12-inch rubber treaded wheels. The three-eighths-inch skin plate is welded to the steel ribs which constitute the upper members of the structural steel trusses which are hinged to the gantry frame. The crown section is moved vertically by means of four 20-ton hydraulic jacks mounted on telescoping gantry legs. The side panels are moved laterally by means of jack screws. The crown and side panels are adjusted to line by use of steamboat type rachet jacks. The form is moved along the 4.47 percent grade by means of a pulley system using either an Ingersoll-Rand air tugger or a Caterpillar D-8 tractor as the prime mover.

On Line and Grade

Prior to moving the lining form into the tunnel the reinforced concrete curb, gutter and tunnel arch footing sections were placed to line and grade along each side of the tunnel to carry the form. The lining reinforcing steel, which was placed from scaffolds, consisted of two layers of five-eighths-inch bars at 24-inch centers along the arch line and two layers of three-quarter-inch bars at

View of the concrete mixing and pumping unit. Conveyor is on the right, the concrete mixer upper center, and the pumpcrete machine is in the lower center. Remix hopper is above the pump, the "siomese" is shown in the lower left of the picture.



24-inch centers placed longitudinally. The inner layer of steel was three inches from the lining surface and the outer layer was imbedded 16 inches from the concrete surface.

After the form had been moved into position and adjusted to line and grade the form was secured in position by placing three-quarter-inch bolts through the bottom flange of the side panels into precast tie holes in the arch footing. The gantry trucks were secured by placing wedges between the wheels and the truck frame and by securing a cable tie from the gantry frame to steel dowels in the arch footings. Blocking was placed between the bottom flange of the side panels and the haunch line of the footings to transmit the loading imposed on the form by the wet concrete to the footings. The form was placed to line and grade with a tolerance of one-eighth of an inch. Electrical conduit, pull boxes, magnetic contactor and transformer vaults, grout pipes and tunnel weepers were bolted, in their prescribed positions, to the outer surface of the form in order that they be either completely encased or have their access covers flush with the surface of the lining as the case required.



Lining form in position for placing of section of tunnel lining at north portal of the tunnel. Pipeline right of center is being used to pump concrete into the forms which constitute a part of the north portal structure.

Pumping concrete to the top of the lining form at the south portal in the cut and cover section. The forms for the voussoir appear left of center.



A timber platform was placed on the lower members of the crown section truss for the purpose of providing a working area during the placing of the concrete in the side panels and for operating the form vibrators. Tubular steel scaffolds with timber decking were placed adjacent to the ends of the form to serve as working areas during the placing of the timber bulkheads and for handling the arch pipe and air tuggers during the placing of the concrete above the form.

Pumpcrete Machine

Because of its important role in the successful lining operations it is believed that a description of the mechanics of the Pumpcrete machine will be of interest. The Pumpcrete system has been defined as the method of transporting concrete through pipelines by means of direct acting pumps. The mixed concrete is discharged from the mixer into a remix hopper into a cylinder and expelled by a piston into the pipeline. Each charge forced into the line pushes all the concrete in the line forward and, as the concrete is relatively incompressible, a nearly equivalent amount is ejected from the end of the line.

The Pumpcrete machine is a heavy duty, single acting horizontal pump much like a heavy duty, piston type water pump. The outlet connection is directly in line with the horizontal cylinder. The remix hopper, of the pugmill type, is mounted above the cylinder head chamber and an inlet valve is located between the hopper and cylinder. The outlet valve is between the chamber and the pipe line. Both inlet and outlet valves are mechanically opened and closed in timed relation to the movements of the piston.

The valves are mechanically actuated from double acting cams on the crank shaft through oscillating arms or "banjos," thence by valve rods to the valves. Springs in the valve rods provide the necessary relief to prevent damage to the operating mechanism.

Cycle of Operation

The cycle of operation is as follows: On the suction stroke of the piston the inlet valve opens (outlet valve closed) and the charge of concrete is drawn

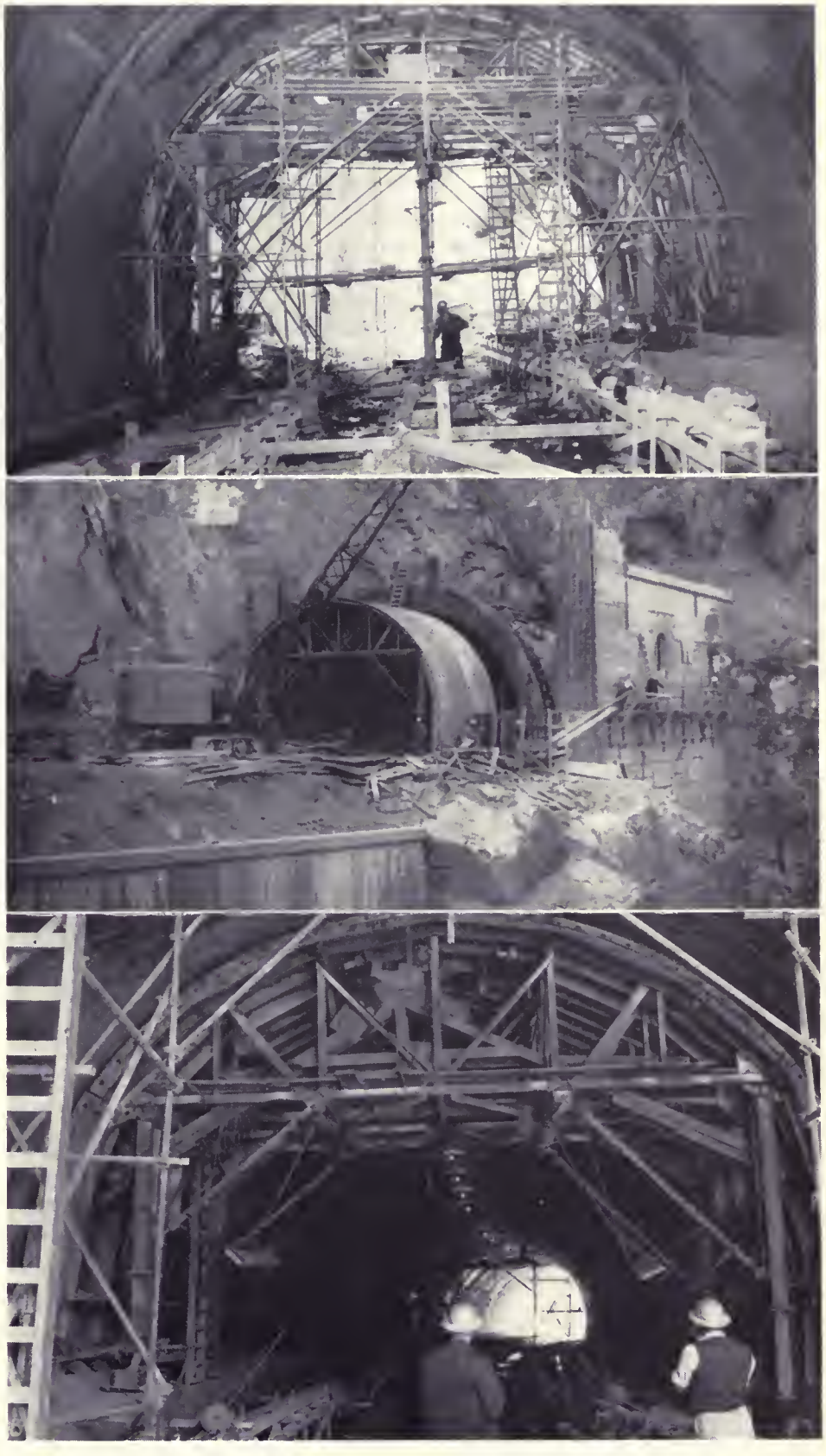
from the overhead hopper through the valve into the cylinder. On the pressure stroke the outlet valve is open (inlet valve closed) and the charge of concrete in the cylinder is pushed from the cylinder into the connecting pipe line with each revolution of the crank shaft.

The metal piston never comes into direct contact with the concrete nor with the metal cylinder walls. A replaceable rubber piston end pushes the concrete. The piston skirt and cylinder wall back of the rubber piston-end are continuously rinsed with washwater. The rubber piston-end keeps the washwater out of the concrete.

After the concrete leaves the pump it moves through the pipe in pulses but at all times the pipe is completely filled and there is no tendency to segregate or disarrange the structure of the concrete mixture. There is a tendency, due to the troweling action of the inside of the pipe, to bring a slight surplus of grout to the outside of the concrete stream which is helpful to pumping as the grout is the only part of the concrete that can act as a lubricant. Due to the remixing action of the pump itself and freedom from segregation in the pipe line, the concrete reaches the end of the line normally in better state of uniformity of mixture than it was at the hopper of the pump.

Combining the two streams of concrete from the double cylinder Pumpcrete involves the use of a "Siamese" pipe section with an enlargement at the junction of the two incoming pipes so that the area at the point where the streams are completely merged is one and one-half to two times the area of either of the incoming pipes. To reduce this to normal pipe size requires the use of a tapered section.

The pipe line from the pump was placed on cribbing along the invert of the tunnel to a location just beyond the forward end of the form where it was elevated, by means of a 180-degree segmented pipe section, to the elevation of the crown truss section of the form. From the elbow the arch pipe was suspended horizontally by chains secured to the tunnel supports.



UPPER—Lining farm in position for placing of concrete tunnel lining. Pumpcrete pipeline is shown rising from tunnel invert to the crown of the form. Operator is operating the air slugger. CENTER—Lining farm as it emerged from the tunnel after the last section of the tunnel had been completed. LOWER—Steel farm in place in foreground. Gantry for finishing tunnel lining in background.

Arch Lining

The first phase of the arch lining operation was to place the concrete be-

hind the side panels. The pipe line was erected to the elevation of the crown section truss where it discharged the concrete into metal lined telescopic chutes which in turn discharged the concrete through hinged access doors in the side panels. The concrete was vibrated by use of immersion type vibrators supplemented by periodic use of form vibrators. After the concrete had reached the elevation of the bottom of the access doors the chutes were withdrawn and the access doors closed and secured with metal wedges. The pipe line was then erected to the elevation of the top of the form where it was connected to the arch pipe.

In the timber supported section of the tunnel the arch pipe was connected to a section of light gauge pipe called a "slick." The slick line was placed through an opening in the timber bulkhead and along the top of the form to a point three feet from the opposite end of the form. In the steel supported section of the tunnel where the head room was restricted, the use of a Siamese slick line was necessary. The Siamese slick line was in the form of an elongated "Y" with the regular seven-inch line branching into two parallel flattened sections of six-inch light-gauge pipe at a point outside of the bulkhead.

Air Sluggers

The Siamese slick line was equipped with an air "slugger" two feet back of the junction, and an air slugger in either leg of the "Y." The air sluggers consisted of compressed air connections tapped into the line, and used to control the direction of the discharge, and to push the concrete away from the discharge end of the pipe in order to fill the furthermost recesses of the form first. As the concrete progressed to the top of the form, the discharge end of the slick line became buried in the concrete, after which the slick was withdrawn at a rate which provided for the continued submergence of the outlet to insure complete packing of the arch. Both the single slick and the Siamese slick were withdrawn from the form by removing short segments of the regular arch line and pulling the slick back to the new connection.

Several sections of the lining were placed by pumping the concrete through the crown section of the form rather than through the bulkheads. To place the concrete by this method, it was necessary to cut a hole in the skin plate of the form, insert a short section of slick line through the sleeve of a special flat plate valve welded to the form, and then connect the slick to a vertical riser of the regular pipe line. The form was filled by straight pumping pressure supplemented by an air slugger placed at the bottom of the riser pipe.



This is a view of the north portal of Gaviota Tunnel

Completing the Pour

When the pour had advanced to a point where the concrete in the hopper and the line was sufficient to complete the pour, the remaining concrete in the hopper was pumped into the line, a shut-off pin type valve in the line near the pump was closed, and the Siamese connection and the tapered section were removed.

The Pumpcrete hopper was then cleaned out and converted to a high pressure water pump by the addition of inlet water valves above the inlet concrete valves and outlet water valves beyond the outlet concrete valves. The converted pump was connected to the pipe line by a Siamese washout assembly behind a section of pipe, which contained two "go-devils" with a wad of excelsior and burlap ahead and behind each go-devil, attached to the

rear end of the pipe line. A "go-devil" is a dumbbell-shaped unit with rubber cups at each end. The cups fit closely in the pipe and are turned towards the pump, the seal being the same as in a single plunger pump.

Operation of Go-devils

The hopper of the Pumpcrete was then filled with water, the pin valve opened and the pumping begun. The water pressure propelled the go-devils, which in turn pushed the concrete in the pipe. As the go-devils advanced, the concrete was forced out of the end of the line into the form and at the same time, the water back of the go-devils rinsed out the pipe. As the go-devil approached the form, the slick line was completely withdrawn and the pour "keyed-off." The riser pipe was then removed to the elevation of the tunnel invert where the go-devil and the water behind it were discharged.

The crew assigned to the mixing and pumping of the concrete consisted of a master mechanic, a crane operator, an oiler, a batch plant operator, a mixer operator, and a Pumpcrete operator and oiler. The placing crew consisted of a foreman, two carpenters, who constructed and maintained the bulkheads, four internal vibrator operators, one form vibrator operator and two men who operated the air sluggers and helped handle the slick line.

Approximately 2,800 cubic yards of concrete were placed in the tunnel lining with the individual pours ranging from 80 to 132 cubic yards depending upon the section being lined and the amount of overbreak. The concrete was placed at the average rate of 22 cubic yards per hour with the maximum of 26½ cubic yards per hour.

Three-inch diameter tunnel weepers and six-inch diameter footing weepers will drain the water from behind the lining into drain galleries on either side of the tunnel.

Removal of Lining Form

The contract specifications provided for the removal of the lining form as soon after placing the concrete as working conditions permitted, providing, however, that should there be any evidence of sagging, cracking or other damage to the concrete the form was to remain in place until removal was authorized by the Engineer. This provision permitted the contractor to schedule his operations to provide for the placing of one section of the lining per day. The form was usually removed within 12 hours but on one occasion it was removed in eight hours without any indications of failure in the concrete arch.



This photograph show the south portal of Goviota Tunnel

The bulkheads were removed as soon as possible to provide for the removal of the keyway forms and the cleaning of the construction joint. Sixteen-gauge galvanized sheet metal water stops were installed between successive pours.

The form was removed by first retracting the form jack screws which brought the bottom flange of the side panels clear of the arch footings. This clearance allowed the crown section to be lowered approximately six inches by releasing the pressure in the four 20-ton hydraulic jacks supporting the crown section on the gantry frame. The form was then removed to the next location.

Each section of lining was water cured for a period of seven days by a system of garden type sprays tapped into a 1½-inch water line suspended from the pull boxes which were cast in the crown of the lining arch.

Batch Plant and Mixer

The 100-ton capacity batch plant and two 250-barrel cement storage

silos were designed and built by the Pacific Coast Tank Company. The bulk cement was loaded into the silos by a screw conveyor which fed a vertical bucket elevator. The cement was conveyed to either silo and to the batch plant by screw conveyors. The batch plant was equipped with four compartments for the coarse and fine aggregates, a 2,000-pound capacity Hardy automatic scale for weighing the cement, and a 10,000-pound capacity scale for weighing the sand and coarse aggregates. The plant was designed so that when dismantled it can be transported by truck without requiring a special permit for over-size load.

The 1½-inch x ¾-inch aggregate and the sand were trucked from the Sisquoc plant of the Southern Pacific Milling Company. The 1-inch x No. 4 aggregate was obtained from the Consolidated Rock Company's plant at Irwindale and shipped in railroad gondolas to the siding at Gaviota and trucked to the jobsite. The aggregates were stockpiled in bulkheaded bins and loaded into the batch plant compartments by a Lorain 77 crane equipped with a 1¼-cubic-yard clamshell bucket. The cement was hauled by tank truck from the Tehachapi plant of the Monolith Cement Company.

The dry batch of coarse aggregates, sand and cement were transported from the batch plant to a Ransome 28S concrete mixer by a 24-inch belt conveyor. The conveyor is covered with a semicircular section of pipe to prevent the loss of cement and aggregate fines to the high velocity winds that blow almost constantly through the gorge. The water for mixing the concrete is obtained from a 600-foot deep artesian well located midway between the batch plant and the south portal of the tunnel, a distance of approximately 150 feet.

The concrete was discharged directly from the one-cubic-yard capacity mixer into the remix hopper of a Double 180 Rex Pumpcrete machine. The purpose of the remixer was to blend the incoming batch with the previous batch in order to provide uniformity and to prevent segregation in the concrete before it was delivered to the pump.

Design of Concrete

The design of the concrete used in the tunnel lining was based on three factors: workability, "pumpability" and strength. The concrete had to be workable in order that the tunnel supports and reinforcing steel would be completely encased with the concrete and to insure a minimum of voids between the lining and the rock surface of the tunnel bore. A high degree of pumpability was essential in order to obtain the maximum efficiency from the concrete pump and minimize the chance of a plugged line. The concrete was found to have maximum pumpability and workability when the slump was between four and five inches. A water cement ration of 0.53 was used to secure the desired slump. Twenty-eight day tests on the concrete indicated an average compressive strength of 3,900 pounds per square inch.

Portal Structures

In excavating for the tunnel footing and the retaining wall footings of the north portal structure it was found that, at the elevations indicated on the plans, the footings would be founded on soil having a bearing value considerably less than that of the rock which had been anticipated at the planned elevations. This necessitated redesign of the footings.

A cost comparison between a combined spread footing of reinforced concrete and a footing based on steel piling indicated that the driving of steel piling was the most practical and economical method of obtaining a secure foundation.

The design of the pile foundation was based on the assumed ability of 10-inch by 10-inch 42-pound bearing piles to develop a bearing value of 30 tons per pile. A total of 32 piles having an average penetration of 20 feet were driven to refusal by a Lorain 77 crane equipped with a boom, a set of leads and a drop hammer weighing two tons. The piles were placed in five rows—one vertical and one batter row under the retaining wall, one vertical row under the center of the piling slab and one vertical and one battered row under the tunnel lining footing. The piles in each row were on four-foot centers.

Lagging Between Webs

Upon the completion of the driving operation, 2-inch by 4-inch lagging was placed between the webs of the outer row of piles to retain the soil during the excavation for a reinforced concrete cut-off wall that extended to an elevation eight feet below the streambed of the adjacent Gaviota Creek. The purposes of the cut-off wall was to prevent the erosion of the material through which the piles were driven. Large boulders were later placed along the face of the cut-off wall at the elevation of the stream channel to deflect the stream flow away from the footing.

A four-foot thick slab of reinforced concrete was placed over the piling to provide a piling cap and a combined footing for the retaining wall, the tunnel footing and the backfill material. The bottom of the slab was two feet below the top of the piling.

The forms for the construction of the portal structures were constructed of five-eighths inch plywood on 2-inch by 6-inch studs and walers. Forms for the outside surfaces were faced with rough form lumber with the unfinished surface in contact with the concrete and with recess strips to present the appearance of sandstone blocks. The forms were held in position by Superior continuous threaded coil rods three-fourths inch in diameter acting as both ties and spreaders.

The concrete for the portal structures was batched, mixed and transported by the same method used for the tunnel lining. The concrete was deposited in the forms through 12-inch "elephant trunks" and vibrated by immersion type vibrators.

After the concrete had been cured and cleaned the exposed surfaces of the portal structures were treated with Rholoff Company "Kemico" acid stain to simulate the buff colored sandstone formation adjacent to the structures.

Concrete Pavement

The concrete used in the construction of the pavement was batched, mixed and transported by the same method employed in the construction of the tunnel lining and the portal structures. The pipe line discharged the

concrete into a swivel chute which allowed the concrete to be distributed over the full width of a 12-foot lane.

The placing of the pavement proceeded from the north end of the tunnel towards the south end near the location of the pump. This procedure allowed for the removal of the 10-foot sections of the pipe as the pour progressed.

The metal side forms for the pavement were the standard nine-inch "L" shaped forms with one-inch timber shims, connected to the base to provide the required 10-inch section. The normal method of securing the metal forms by means of steel stakes was not generally practical in this case as the base consisted of a layer of six inches of relatively loose rock under which was the solid rock of the tunnel invert. In order to obtain a foundation upon which to secure the forms, 24-inch by 12-inch by 4-inch concrete pads were cast in place at 25-foot centers along the centerline of the tunnel. The forms were fastened to bolts cast in the pads and adjusted to line and grade. Steel stakes were also placed, where possible, to minimize lateral movement of the forms.

Concrete Distribution

The concrete was distributed uniformly and vibrated with immersion type vibrators. The concrete was then brought to the required grade and shape by a hand operated strike-off float consisting of a 2-inch by 6-inch plank 13 feet long trussed to provide stiffness and prevent sag. Plow handles at either end were provided to facilitate handling and tamping. The float was moved longitudinally by two men pulling on ropes attached to eye bolts placed near the ends of the float.

Tamping of the concrete, to force the larger rock away from the surface and bring mortar to the surface to facilitate finishing, was performed by a bull float operated by two men working from bridges spanning the pavement. The bull float was raised and dropped so that the concrete was thoroughly compacted and rammed into place. The tamping action was followed by a transverse screeding action which brought the mortar to the surface. Utility floats were used to bring the mortar to a uniform surface.

After the tamping was completed and the mortar was still plastic a wooden float was operated from the side of the pavement and parallel to the center line of the pavement by means of a long handle. The edge of the float was used to cut down the high areas and float the excess material into depressions. The float was operated until a true surface was obtained. Each successive passage of the float lapped the previous path. The float was then brought back and used to smooth the overlap between the two passages. The final float was a steel-shod cutting float operated in the manner of the first float but at a time when the concrete had hardened sufficiently to avoid leaving a trowled finish. The finish floats were 16 feet long, one inch thick and four inches wide and rigidly ribbed with adjusting screws at 24-inch centers between the rib and the float to insure a true and flat surface.

Final Finish

The final finish was obtained by the use of a burlap drag pulled longitudinally along the pavement.

In order to drain the warm sulphur water that percolates through the rock invert of the tunnel a six-inch layer of crushed rock filter material was placed on the subgrade prior to placing the concrete pavement. Water drains through the pervious base into two-inch collector pipes placed at 16-foot centers and 16 inches below the profile grade and thence into the left longitudinal drain gallery through the curb and gutter section.

An analysis of the water in the tunnel indicated that the water contained 136 p.p.m. of hydrogen sulphide. In order to minimize the detrimental effect of the hydrogen sulphide gas on the concrete pavement an impervious membrane seal of grade 60-70 paving asphalt emulsion was placed over the pervious base material. To prevent the emulsion from being lost into the pervious base a continuous layer of Sisalcraft paper was placed over the pervious base after which the emulsion was applied at the rate of 0.35 gallons per square yard by a hand operated pressure spray from a distributor truck.

Painting

After the tunnel lining had been completed it was decided to paint the tunnel bore in order to provide utmost in visibility and safety to traffic. One coat of primer consisting of silicone crystal solution, which will retard the efflorescence on the tunnel lining, and waterproof the surface, was applied by spray gun and followed by a prime coat and a finish coat of a flat white cement base paint. The completed work provides additional visibility which will be most essential and desirable during the time the tunnel will have to be used for two-way traffic, prior to completion of the adjacent grading and paving contract.

Work Remaining

The installation of a lighting system, and development of the parking area adjacent to the historical monument to be re-established south of the tunnel will be done under separate contracts.

The construction of the Gaviota Gorge Tunnel is under contract to the Rhoades-Shofner Construction Company of Los Angeles, of which A. A. Mathews is Chief Engineer and W. A. Ripley is Superintendent. The contract is being administered by the Division of Highways, District V, E. J. L. Peterson, District Engineer, and C. I. Brown, Assistant District Engineer (Operations) and M. F. Masters, District Construction Engineer. The author is Resident Engineer.

During the course of experiments with alloy steel blades for road graders, the State Division of Highways evolved a method of controlling heat treatment and hardness for low-cost carbon steel blades which has increased the wear of the blades about 50 percent at no extra cost.

Inspection and testing forces of the State Division of Highways in Sacramento, Berkeley and Los Angeles performed approximately 18,000 individual tests during the 1951-52 Fiscal Year while sampling and inspecting 25,400,000 pounds of structural steel, 25,000,000 pounds of reinforcing steel, 22 miles of steel guard rail, and 55 miles of concrete and clay pipe.

Four Years After

All Business in Fairfield Gains From Bypass Project

By JOHN F. KELLY, Headquarters Right of Way Agent

On JULY 2, 1949, the freeway bypass of the City of Fairfield was opened to traffic and Fairfield was no longer the community strategically situated on the highway between San Francisco and Sacramento to receive a major portion of the through traffic business. In line with our policy of making economic studies of the effects of freeway construction on abutting and bypassed properties, a study was completed and published in the January-February, 1951, edition of the *California Highways and Public Works* magazine.

The facts in that study lead to a conclusion that businesses catering specifically to the highway traffic patronage had suffered from removal of this traffic by the freeway construction; however, the stores that were catering to the general needs of the community and which represented 73 percent of the retail outlets showed an increase of 14.1 percent above the county average.

Reason for Study

Since the publication of that study there has been considerable inquiry and conjecture about the continuing effect of through traffic removal on the retail business in Fairfield; the greatest amount of interest centering around the cafes, bars and service stations which had suffered business losses immediately after removal of the through traffic. It is the aim of this study to trace the economic effects up to the present time to ascertain whether the losses indicated by these businesses in the first year after traffic removal were a temporary setback, or whether these particular outlets are continuing to show decreased sales.

The utilization of the gross business returns reported to the State Board of Equalization for sales tax purposes has been used in this study in the same manner as employed in the original study. This makes a direct comparison in all business aspects possible without the use of undue interpretation or adjustment. The major notable difference in the two reports is that the first study was a direct comparison of the conditions before the removal of through traffic with the conditions immediately following. In the present study, rather than being a direct comparison, interest centers on the progression through the adjustment period into a stabilized business era which reflects the local businessmen's ability to merchandise to a growing community.

Travis Air Force Base

This study covers a period of four years since the realignment of the highway, and with the extended period of time, should have a tendency to eliminate the minor deviations which sometimes over-emphasize reactions in a study of shorter duration.

Before stating the actual business analysis, consideration should be given to a condition which has had a tremendous influence on Fairfield's present status. Since the 1951 report, the Travis Air Force Base located nearby has become on of the largest air bases in the Nation. The latest official figures show a total of 10,850 military and civilian personnel. Housing facilities on the base provide living quarters for 1,301 families, in addition to quarters for unmarried personnel. The remaining 3,061 military and civilian family heads without housing accommodations on the air base, of necessity must seek housing in the general area. With this backlog of demand it is understandable that the residential building activity in Fairfield since July, 1949, has been phenomenal. No other city of comparable size in Northern California has experienced such an increase in the number of single and multiple family dwellings during the past four years. At the present time, 1,237 units have been completed and plans have been completed for the construction of many more in the immediate future. The accompanying map of Fairfield shows the location of the 1,237 residential units completed since July, 1949. The majority of this new construction has been within the 22 residential tracts developed along the northerly side of the city.

Population Growth

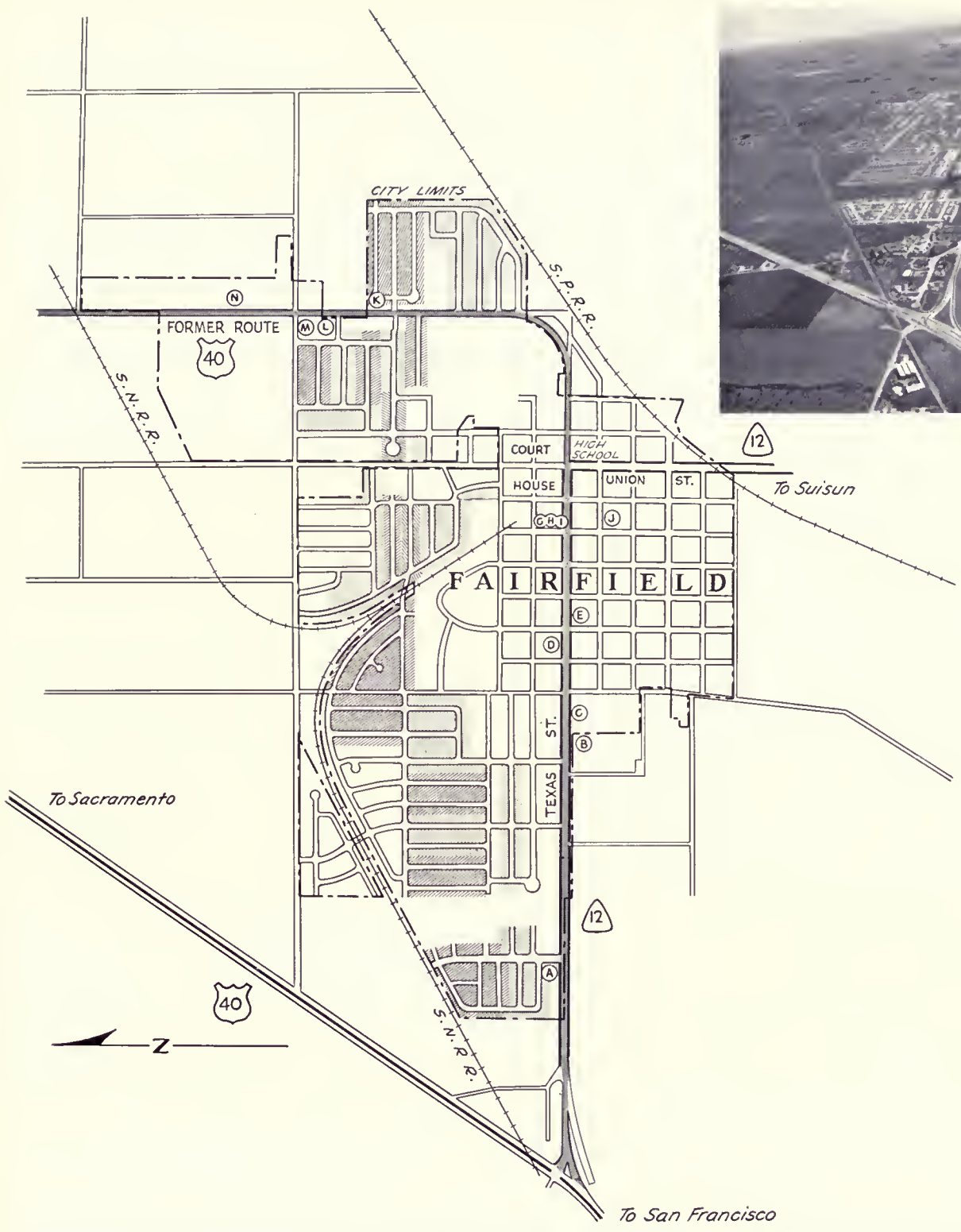
During the four-year period, 1949 through 1952, Fairfield enjoyed a population growth of 40 percent, whereas Solano County had an increase of 26 percent. However, the number of building permits for single family residences in Fairfield exceeded the total number of residence permits issued throughout Solano County by 40 percent. This comparison is an indication of the permanence of the current growth in this area and clearly indicates the magnitude of the residential building program.

In addition to housing, consideration should be given to the increase in the commercial possibilities of catering to this increased military and civilian personnel. The current average monthly pay roll for all personnel at Travis Air Force Base approaches $3,000,000. In addition to this figure, there are an estimated 3,000 dependents of air force personnel living in the Fairfield area receiving monthly allotments ranging from $75 to $200 per month.

This large pay roll at Travis Air Force Base naturally influences the economy of Fairfield and neighboring towns. The commissary and post exchange at Travis do not adequately serve the needs of the personnel on the base, therefore, the neighboring towns have the opportunity of selling consumer goods to many of the people from Travis.

Commercial Development

Undoubtedly this influence has contributed to the commercial building activity in Fairfield which represents an expenditure of over three-quarters of a million dollars since 1949. The accompanying photos show



Shoded areas in this map of Fairfield show location of 22 residential tracts, where 1,237 residential units have been constructed since July, 1949. New alignment of U. S. Highway 40 is shown along lower left side of map. Heavy line along Texas Street identifies location of the old alignment through Fairfield. INSET—Aerial photo. View of Fairfield today. Highway 40 bypasses city. Old route went through central section of Fairfield.

some of the commercial structures recently constructed in the city. The interesting fact is that the majority of the commercial activity has taken place on Texas Street, the superseded Highway Route 40 through Fairfield.

Conspicuous among the new commercial improvements constructed on Texas Street are two motels. The accompanying photo shows one of the new motels which is situated within the main business district. There was

an older motel on this property, but the new structure was not built until after Highway 40 traffic was removed from Texas Street.

Other commercial improvements which have attracted considerable attention in the community are the two large supermarkets constructed on Texas Street, an attractive automobile sales agency and a furniture store. The largest and most expensive single unit being constructed in Fairfield is the new Pacific Telephone and Telegraph Company plant. This $300,000 installation and the new Pacific Gas and Electric Company building represent utility company expenditures in Fairfield. It is not likely that the utility companies would make substantial investments in the community, unless they are confident that the growth is of a permanent nature. The third important factor that affects the general development of this community, much of which generates from the Travis Air Force Base activities, is the traffic volume.

Traffic

In order to make a fair analysis of the increased traffic before and after the realignment of Highway 40, consideration should be given to the increased number of vehicles which are on the highway today. Vehicle registration between 1948 and 1952 increased throughout California by 33 percent. Solano County has shown an increase of 39.8 percent vehicle registration during the same period of time.

The traffic volume on Texas Street in 1948 consisted of 15,000 vehicles on an average week day. It is estimated that 9,500 of these vehicles were Highway 40 through travelers. An additional 2,500 vehicles were through motorists using Texas Street as a portion of State Highway No. 12 toward Rio Vista. This highway intersects Texas Street west of Fairfield and leaves Texas Street at the intersection of Union Street to proceed southwest. The accompanying map of Fairfield indicates the location of this state highway route through Fairfield. Considering the total volume of through highway traffic on Texas Street in 1948, it is apparent that only one-sixth of the vehicles were local motorists; that is, vehicles which either originated or whose destination was in Fairfield.

A new traffic survey has recently been completed on Texas Street and along the new alignment of Highway 40 north of Fairfield. Today there are a total of 10,000 vehicles using Texas Street on an average week day. The survey also shows that at the present time there are 13,000 vehicles on Highway 49 bypassing Fairfield. Theoretically, we can assume that if Highway 40 was still routed through Fairfield, there would be 23,000 vehicles on Texas Street today.

Analyzing the present traffic on Texas Street, we find that approximately 50 percent of the vehicles originated, or have their destination, in Fairfield. The remaining 50 percent of the 10,000 vehicles on Texas Street today are vehicles following State Highway Route 12 through the city.

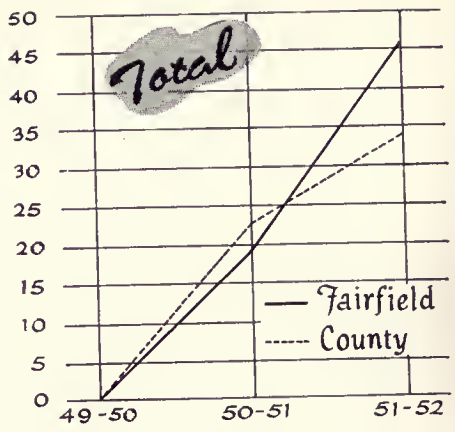
Retail Business

The following statistics cover a time period beginning July 1, 1949, and ending June 30, 1952. The retail outlets have been segregated so that a clear distinction can be made between those business formerly deriving a substantial part of their income from highway traffic, such as cafes, bars and service stations, and the retail outlets which served the needs of the community such as clothing, grocery and furniture. This type of retail outlet has been grouped together and referred to as "all other business."

Total Business Gains

The total gross sales of all retail outlets has increased 45.5 percent during this period. Tabulation of total volume of retail business in Solano County for the same period shows an increase of 34.4 percent. This indicates that Fairfield has enjoyed an 11.5 percent increase over and above that of the county, or over and above that which could be considered a normal expectancy.

In the year immediately following removal of through traffic, total volume of retail business in Fairfield increased 4.5 percent as compared to a 5.0 percent increase in Solano County. These figures clearly indicate that after the period of adjustment which occurred in the first year after



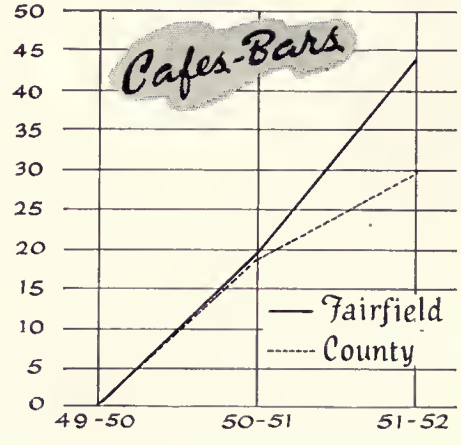
the freeway realignment, the community has progressed business-wise in proportion to the area's population growth and merchandising potential.

Cafes and Bars

The gross sales of cafes and bars since July, 1949, have increased 43.7 percent. The same class of business throughout Solano County increased 39.7 percent, or a net gain over and above that of the county of 14.0 percent.

Cafes and bars formerly catering to highway traffic enjoyed a business volume in excess of the normal expectancy for a city the size of Fairfield. Therefore, it was not surprising that the facts in the first economic study revealed that cafes and bars decreased 30 percent during the year immediately after the realignment of Highway 40, while cafes and bars throughout Solano County decreased 5.6 percent.

The facts in the previous study indicated that cafes and bars lost their highway customers who were in the habit of stopping at Fairfield. The









Examples of the recent building activity in Fairfield are shown in these photographs. (1) The main business district on Texas Street, formerly U. S. Highway 40. (2) One of the new residential subdivisions being developed in the city. (3) New motel constructed on Texas Street after the realignment of U. S. Highway 40. (4) One of the new super markets recently constructed on Texas Street. (5) The new Pacific Telephone and Telegraph Company building being constructed in downtown Fairfield.





extent of the loss made it apparent that they would need to make adjustments whereby they no longer relied upon transient business.

The above figures indicate that these merchants have made this adjustment in a satisfactory manner.

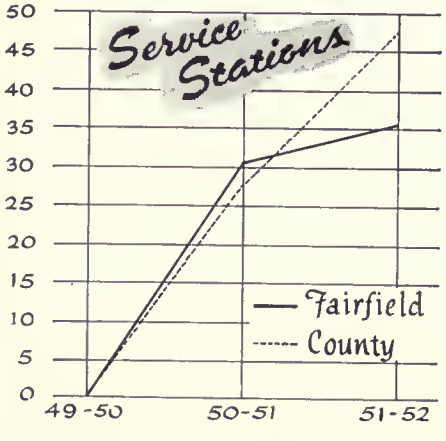
Service Stations

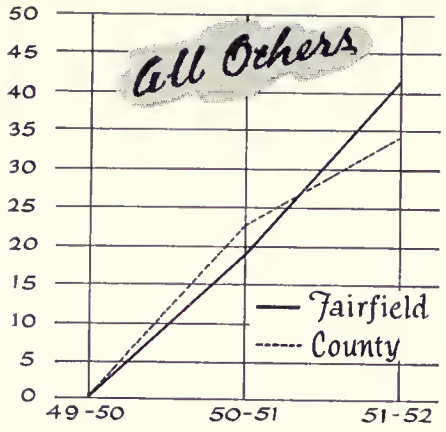
Gross sales since 1949 of service stations in Fairfield show an increase of 35.3 percent, while Solano County increased 47.4 percent during the same period, and as indicated on the accompanying line-graph. The number of stations throughout the county increased by 6 percent, while Fairfield remained constant.

This would indicate that the service stations in Fairfield have adjusted and are now catering to local patronage. It also appears that they have increased their business to a definite point and are reaching a constant which is probably the buying capacity of the community.

All Other Business

The majority of the business in the community is reflected in the gains or losses within this class of retail outlet. This survey reveals that the majority of retail outlets in Fairfield increased their gross sales by 41.5 percent since July, 1949. At the same time the majority of retail business in Solano County made gains amounting to 34 percent. Fairfield excelled the county by 11.5 percent, which is exactly the same difference which appeared for the total volume of business. In checking the tabulation of the figures, we find this percentage difference happened to be coincidental. However, it is not a strange coincidence because





the "All Other" class of business represents a large portion of the total volume.

Referring back to the previous economic study, we find that "All Other" business in Fairfield increased 22.6 percent, whereas Solano County increased 8.5 percent. The difference between the town and county was much greater during the year following the removal of through traffic from the business district of Fairfield. The highway travelers who stopped in Fairfield did not patronize the retail outlets which supplied the basic needs of the community. Their purchases were confined principally to cafes, bars and service stations. In fact, it is this group of retail outlets which comprise the majority of the community business, which benefits the most by the removal of through traffic.

The removal of the highway traffic showed an immediate benefit to the "All Other" class of retail outlet. This gain was reflected in the difference in gross sales between Fairfield and the county immediately after the by-pass went into effect.

Conclusion

A review of the facts in this study clearly indicate that:

1. Travis Air Force Base is to a large degree responsible for the majority of the growth and development which has taken place in Fairfield during recent years.

2. Those retail outlets which suffered business losses immediately after the realignment of U. S. Highway 40 have made a successful readjustment and are now enjoying higher business returns from the increased patronage of local customers without the congestion of through traffic.

3. Removal of the heavy volume of through traffic from the business district in Fairfield aided in providing an uncongested and easily accessible shopping center ready to serve the new residential growth.

4. It is reasonable to assume the desirability of the existing business district without traffic congestion in Fairfield discouraged the development of a new competitive shopping area.

5. The construction of new motels in the Fairfield area is indicative that proper approaches to the area from the by-pass and the accessibility of related services are equally as important as the volume of the traffic.

OUT-OF-STATE CAR ENTERS CALIFORNIA EVERY 25 SECONDS

An out-of-state automobile entered California every 25 seconds during the first three months of this year, the Touring Bureau of the Automobile Club of Southern California reports.

An all-time high of 319,847 cars, carrying 837,297 passengers, checked into border stations during the three-month period. This is an increase of more than 15 percent over the 277,240 "foreign" cars which entered the State during the first quarter of 1952. The passenger count during the same period last year was 704,828.

More than 61 percent of the automobiles checked into the State through the five Southern California border stations. The count was 197,-876. During the first quarter last year, 185,087 cars entered through the five stations.

Since the San Francisco-Oakland Bay Bridge was opened to traffic in 1936, nearly 64,000 vehicles have run out of gas on the bridge; another 65,000 have had to be towed off because of engine trouble, accidents or because they were not carrying spare tires; and 38,000 had to have their tires changed, bringing the total breakdowns to date to nearly 167,000. This is an average of more than 28 vehicles each day or, to put it another way, one car out of every 2,050 crossing the bridge has had some sort of breakdown before it got to the other end.

Cost Index

California Highway Construction Costs Dip 3.5 Percent in First Quarter of 1953

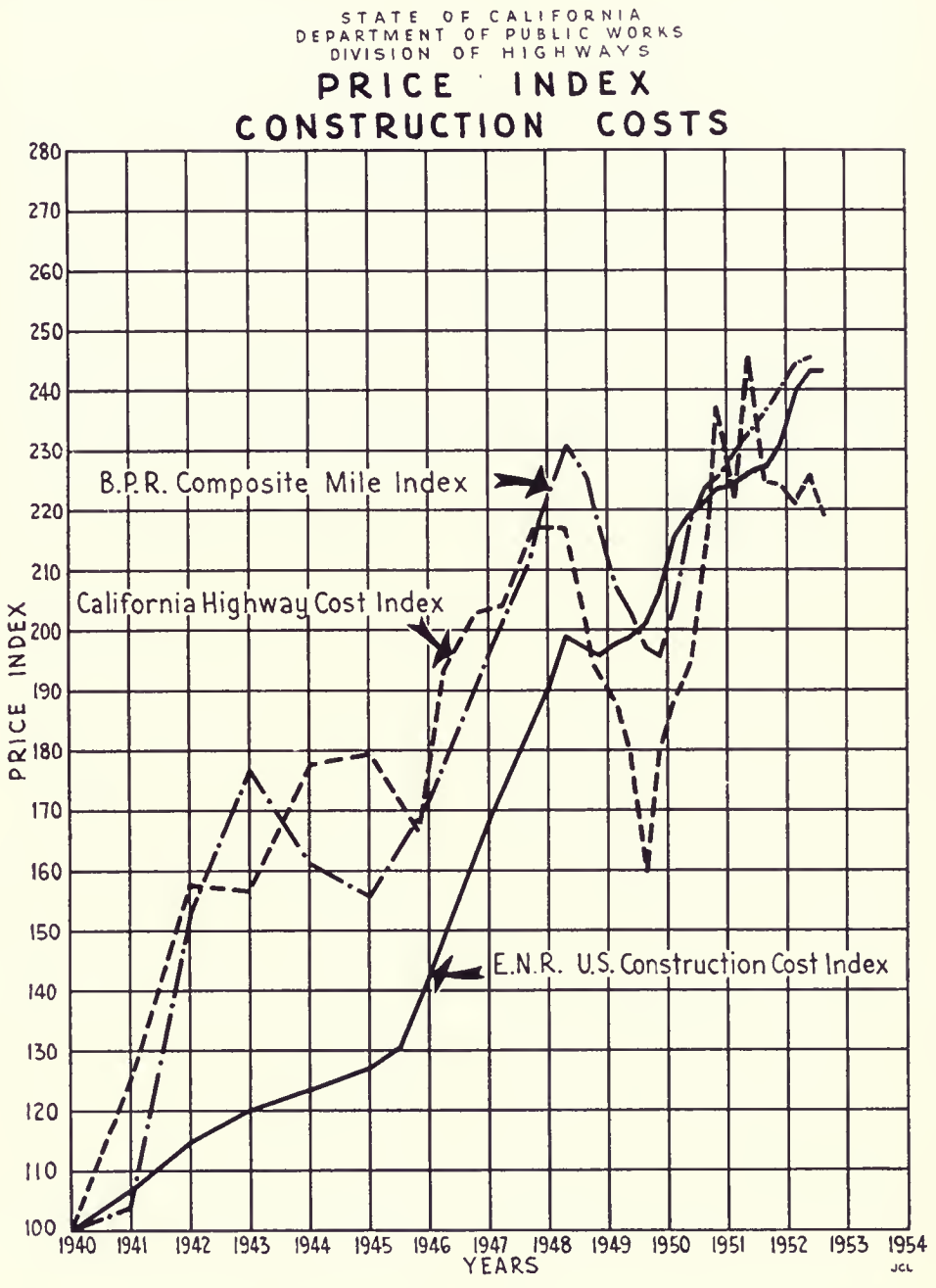
By RICHARD H. WILSON, Assistant State Highway Engineer
H. C. McCARTY, Office Engineer
J. D. GALLAGHER, Assistant Office Engineer

Construction costs on state highway projects on which bids were opened during the first quarter of 1953 were 3.5 percent lower than those of the fourth quarter of 1952 as reflected by the California Highway Construction Cost Index.

The index, which is computed on the base of 1940 = 100, stood at 218.3 for the first three months of the year. This is 7.9 points below the 226.2 of the last quarter of 1952. The first quarter of 1953 index of 218.3 is 27.1 index points or 11.0 percent below the 245.4 of the fourth quarter of 1951, which was the quarter of highest costs as indicated by the index, and is 58.3 index points or 36.4 percent over the 160.0 of the third quarter of 1950, which was the low point dip in prices prior to the beginning of the Korean War.

The following is a tabulation of the California Highway Construction Cost Index by years and quarters since 1940:

Year	Cost Index
1940	100.0
1941	125.0
1942	157.5
1943	156.4
1944	177.8
1945	179.5
1946	179.7
1947	203.3
1948	216.6
1949	190.7
1950 (1st quarter)	160.0
1950 (2d quarter)	180.0
1950 (3d quarter)	189.2
1950 (4th quarter)	194.8
1951 (1st quarter)	215.4
1951 (2d quarter)	238.3
1951 (3d quarter)	221.9
1951 (4th quarter)	245.4
1952 (1st quarter)	224.8
1952 (2d quarter)	224.4
1952 (3d quarter)	221.2
1952 (4th quarter)	226.2
1953 (1st quarter)	218.3



The 3.5 percent drop in the index during the first quarter of 1953 is almost entirely due to a 32 percent decline in the average price of roadway excavation (from $0.66 to $0.45). While crushed rock and Portland cement concrete pavement were also down slightly, the average prices for

Number of Bidders Prequalified to Bid On State Highways

The following data shows number of contractors qualified to bid State highway projects as of January 29, 1953. Based on their maximum ratings, these 611 contractors are grouped as follows:

$10,000,000 and over	— 29
5,000,000 to 10,000,000	— 63
2,500,000 to 5,000,000	—103
1,500,000 to 2,500,000	—162
1,000,000 to 1,500,000	—222
500,000 to 1,000,000	—319
250,000 to 500,000	—437
100,000 to 250,000	—522
50,000 to 100,000	—549
up to 50,000	—611

The combined bidding capacity February 1, 1953, of these 611 contractors was $1,263,819,000 or in round figures $1,265,000,000.

In arriving at this combined bidding capacity figure all ratings in excess of $20,000,000 are entered at the $20,000,000 figure.

other items used in compilation of the index registered increases.

Plant-mixed surfacing average prices rose from $4.97 to $5.27 per ton; structure concrete increased from $48.45 to $53.19 per cubic yard; bar reinforcing steel rose from $0.094 to $0.098 per pound and structural steel increased from $0.128 to $0.150 per pound.

These facts would indicate that in spite of the 3.5 percent over-all decline in the index, costs of some major items are still on the rise. However, both the Engineering News-Record Construction Cost Index and the U. S. Bureau of Public Roads Composite Mile Index, as shown on the accompanying chart, indicate their first leveling-off in the last four years.

It is thought that the drop in roadway excavation merely reflects the seasonal effort of bidders who have completed work in the fall and early winter to insure their obtaining jobs

. . . Continued on page 55

AVERAGE CONTRACT PRICES

	Roadway excavation, per cu. yd.	Crusher run base, per ton	Plant-mix surfacing, per ton	Asphalt concrete pavement, per ton	PCC pavement, per cu. yd.	PCC structures, per cu. yd.	Bar reinforcing steel, per lb.	Structural steel, per lb.
1940	$0.22	$1.54	$2.19	$2.97	$7.68	$18.33	$0.040	$0.083
1941	0.26	2.31	2.84	3.18	7.54	23.31	0.053	0.107
1942	0.35	2.81	4.02	4.16	9.62	29.48	0.073	0.103
1943	0.42	2.26	3.71	4.76	11.48	31.76	0.059	0.080
1944	0.50	2.45	4.10	4.50	10.46	31.99	0.054	0.132
1945	0.51	2.42	4.20	4.88	10.90	37.20	0.059	0.102
1946	0.41	2.45	4.00	4.68	9.48	37.38	0.060	0.099
1947	0.46	2.42	4.32	5.38	12.38	48.44	0.080	0.138
1948	0.55	2.43	4.30	5.38	13.04	49.86	0.092	0.126
1949	0.49	2.67	4.67	4.64	12.28	48.67	0.096	0.117
1st quarter 1950	0.34	2.22	3.65	3.74	....	40.15	0.077	0.081
2d quarter 1950	0.40	2.13	4.48	3.74	10.86	43.03	0.080	0.105
3d quarter 1950	0.41	2.32	4.25	5.50	10.91	44.34	0.093	0.131
4th quarter 1950	0.42	2.81	4.64	4.61	12.55	43.18	0.098	0.120
1st quarter 1951	0.45	3.07	4.06	5.22	11.71	46.38	0.103	0.206
2d quarter 1951	0.63	3.88	4.56	4.63	12.93	51.50	0.105	0.166
3d quarter 1951	0.56	2.88	4.59	3.90	12.41	46.14	0.107	0.165
4th quarter 1951	0.66	2.91	5.66	4.89	12.71	49.38	0.105	0.169
1st quarter 1952	0.56	3.25	4.88	4.77	14.25	47.46	0.094	0.152
2d quarter 1952	0.53	3.19	5.29	4.13	14.20	49.12	0.091	0.143
3d quarter 1952	0.55	2.61	5.49	4.60	12.80	48.21	0.094	0.132
4th quarter 1952	0.66	2.68	4.97	....	12.53	48.45	0.094	0.128
1st quarter 1953	0.45	2.48*	5.27	4.46	12.47	53.19	0.098	0.150

* Untreated rock base substituted for crusher run base at this point.

NUMBER AND SIZE OF PROJECTS, TOTAL BID VALUES AND AVERAGE NUMBER OF BIDDERS

(July 1, 1952, to December 31, 1952)

Project volume	Up to $50,000	$50,000 to $100,000	$100,000 to $250,000	$250,000 to $500,000	$500,000 to $1,000,000	Over $1,000,000	All projects
Road projects:							
Number of projects	75	26	28	14	7	1	151
Total value (bid items)	$1,658,528	$1,800,875	$4,469,587	$4,568,889	$4,811,328	$1,919,792	$19,228,999
Ave. number bidders	3.9	4.5	6.0	5.1	6.4	5.0	4.6
Structure projects:							
Number of projects	16	11	4	4	2	2	39
Total value (bid items)	$378,558	$782,590	$726,929	$1,467,222	$1,233,486	$4,101,836	$8,690,621
Ave. number bidders	4.1	5.7	7.3	9.0	9.5	6.0	5.8
Combination:							
Number of projects					2	4	6
Total value (bid items)					$1,917,715	$9,012,508	$10,930,223
Ave. number bidders					3.0	8.1	6.5
Summary:							
Number of projects	91	37	32	18	11	7	196
Total value (bid items)	$2,037,086	$2,583,465	$5,196,516	$6,036,111	$7,962,529	$15,034,136	$38,849,843
Ave. number bidders	3.9	4.8	6.2	5.9	6.4	7.1	4.9

Total Average Bidders by Months

	July	Aug.	Sept.	Oct.	Nov.	Dec.
1952	4.3	4.3	5.9	5.1	5.9	4.8
1951	4.3	4.0	4.6	4.4	8.0	7.3

Roadside Trash

Santa Barbara County Boy Scouts Perform Good Deed

At the summit of San Marcos Pass, north of Santa Barbara on State Sign Route 150, there was on display for an entire week in March a pile of rubbish five feet high, covering an area 12 feet wide and 30 feet long.

The pile—composed of tin cans, bottles, boxes, tires, junk metal, cartons, and even old Christmas cards—was the "harvest" from a one-day Boy Scout roadside cleanup campaign which covered 14 miles of scenic highway crossing the Santa Ynez Mountains.

The Boy Scout project provided another dramatic illustration of the problem created by the insistence of some motorists on using highways and roadsides as a public dump. In addition to its obvious detraction from the scenic attractiveness of the California countryside, the indiscriminate tossing or depositing of rubbish along the highway by motorists is costly in terms of hard cash as well.



Boy Scouts of Santa Barbara County staged a one-day roadside cleanup campaign along 14 miles of State Sign Route 150, the San Marcos Pass Highway, in connection with National Conservation Week. This pile of assorted rubbish is the result. It was collected and left on display at the summit of the pass for several days, to dramatize the end result of careless depositing of trash along State highways.

Costs Run High

It costs the State Division of Highways about $450,000 a year to remove and dispose of roadside rubbish along the 14,000 miles of state highway in California, an average of $35 a mile.

Actually, the annual cost can run from almost nothing on some lightly traveled remote mountain routes to $1,600 a mile on some sections of heavily traveled freeway. Some stretches of highway yield as much as a large truckload of refuse every week.

State highway crews are equipped and trained to maintain the roads in safe condition for travel. For economy, the operations are highly mechanized. It is costly and contrary to public interest to divert the equipment operators and other maintenance men from their main tasks in order to pick up the roadside litter left by thoughtless motorists.

Boy Scouts Do Good Deed

The Boy Scouts' "good deed" on Sign Route 150 was a mass effort, sponsored by the scout organization in Santa Barbara County. A total of 169 boys and 24 adult leaders took part, including groups from Santa Maria and Lompoc as well as Santa Barbara.

One group started at the intersection of U. S. 101 and the San Marcos Pass route just west of Santa Barbara; the other started at the San Lucas Bridge in the Santa Ynez Valley. Both worked toward the summit, the boys gathering up the rubbish and placing it in trailers and pickup trucks which patroled the route.

The Division of Highways, through the Maintenance Department in District V, made red flags and hand stop signs available to the scouts for use in warning traffic that the cleanup drive was in progress.

After the pile of accumulated roadside litter had remained on view at the summit of the route for several days, it was hauled away for disposal by Division of Highways trucks.

State highway maintenance workers pointed out that the San Marcos Pass Highway has always been regarded as one of the brighter spots in the roadside rubbish picture.

AUTO ACCIDENT TOLL IS WORST IN NATION'S HISTORY

More than 2,000,000 casualties, the worst automobile accident toll in the Nation's history, were recorded in 1952, according to figures released by the Traveler's Insurance Companies.

Last year's traffic deaths totaled 37,600, an increase of 500 over the 1951 mark. The injury count soared to 2,090,000, more than 127,000 over 1951.

The death and injury totals are highlight statistics from "Who, Me?" nineteenth in an annual series of traffic accident data booklets published by the Travelers. Company statisticians collect and analyze accident facts from each state.

The most dangerous mistake in driving last year was excessive speed.

Assembly Honors The Memory of A. Teichert, Jr.

THE ASSEMBLY of the California Legislature, when it adjourned on May 12th, did so out of respect for the memory of Adolph A. Teichert, Jr., nationally known construction contractor, after adopting the following resolution:

WHEREAS, The Members of the Assembly have received with deepest regret news of the passing in Sacramento on May 6, 1953, of Adolph A. Teichert, Jr., prominent California community leader and construction contractor; and

WHEREAS, Adolph A. Teichert, Jr., was born in San Francisco, April 24, 1885, graduated from the University of California at Berkeley with a Bachelor of Science degree in 1908, and through his personal skill, resourcefulness, and ingenuity rose to become President and General Manager of the well-known construction firm of A. Teichert & Son., Inc.; and

WHEREAS, As recognition of his abilities and achievements he wos Past President of the Associated Contractors of America, and also of its Northern California Chapter; and was Vice President of the Sacramento Guarantee Building and Loan Association, Buffalo Brewing Company, Fidelity Title Insurance Company, and the El Dorado Limestone Company; and

WHEREAS, He ossumed a foremost role in state service and civic affairs as former President of the Sacramento Chamber of Commerce, The Community Chest, Young Men's Christian Association, and Exchange Club, as a charter and life member of the Ben Ali Temple of the Shrine, as a life member of the Shriners Crippled Children Hospital organization, as a Thirty-second Degree Mason in the Sacramento Scottish Rite Bodies, and as a member of the State Chamber of Commerce, the Consulting Engineers of America, Inc., Rotory Club, Del Paso Country Club and Sutter Club; now, therefore, be it

Resolved by the Assembly of the State of California, Thot when the Assembly adjourns today it does so out of respect to the memory of Adolph A. Teichert, Jr.; and be it further

Resolved, That the Chief Clerk of the Assembly is hereby directed to transmit suitably prepared copies of this resolution to Mrs. Alma Teichert, widow; Miss Nancy Teichert, daughter; Henry Teichert and Adolph H. Teichert, sons; Mrs. Caroline Skinner, sister; and Frederick Teichert, Rosalind Teichert, and Jonathan Teichert, grandchildren.

To lessen the chances of roadway slipouts and slides, 12,000 lineal feet of horizontal drains were installed at various locations by the State Division of Highways during the 1951-52 Fiscal Year.

By combining 50 percent palmyra and 50 percent hickory fiber on power brooms, the State Division of Highways has increased the wearability of the brooms on its equipment by 50 percent at no additional cost.

New Sign Routes Added to State Road Map

TWO NEW highway sign route numbers will appear on future revisions of road maps made available to California motorists.

The California Division of Highways announces the completion of its latest master map of the State showing U. S. and state sign routes. This master map, which the division brings up to date each year, is made available to tourist bureaus, auto clubs, map printing firms, oil companies and other public or private agencies who produce maps for the convenience of the motoring public.

Major Changes

The major changes over the 1952 version of the sign route map are:

Highway 30—A newly-numbered route between the Los Angeles area and the Big Bear Lake resort country.

Highway 28—Along the north shore of Lake Tahoe.

Highway 128—A new number, assigned to the former Highway 28, between the Mendocino Coast and Winters, in Yolo County.

U. S. 395—Follows a new section of highway between Temecula and Perris, in Riverside County, instead of via Elsinore.

Highway 30, located in San Bernardino County, follows Highland Avenue and City Creek Road, with its temporary western terminus in Upland at the junction of Euclid Avenue and Foothill Boulevard (U. S. 66). The eastern end of Highway 30 is at Running Springs on Highway 18 west of Big Bear Lake.

City Creek Road Traffic Increases

Eventually, Highway 30 will follow Highland Avenue all the way from its western terminus near Glendora, in Los Angeles County. This permanent route designation will not be made, however, until the portion of Highland Avenue between Glendora and Upland has been improved.

Since the improvement of City Creek Road two years ago, more and more cars from the Los Angeles area are using this route as an alternate way of getting to Lake Arrowhead and Big Bear Lake.

The hitherto unnumbered highway along the north shore of Lake Tahoe between Tahoe City and the California-Nevada boundary has been designated as new State Sign Route 28, joining Nevada Sign Route 28 at the state line.

New Number for Sign Route 28

The former State Sign Route 28, which extended from State Sign Route 1 at the mouth of the Navarro River to Winters, in Yolo County, has been redesignated as State Sign Route 128. This change made possible the assigning of number 28 to the Lake Tahoe north shore route.

The newly-constructed stretch of highway between Perris and Temecula, in Riverside County, has been officially designated as U. S. 395, replacing the old portion through the City of Elsinore. This procedure is routine in the case of major relocations. State Route 71 still goes through Elsinore.

The division has been issuing a revised edition of its master map each year since 1934.

Fill Construction

Continued from page 14 . . .

Elm Street Overcrossing

The freeway is carried over Elm Street by an overcrossing and the grade of the existing street was lowered about two and one-half feet to obtain clearance and drainage. Here, ground water level is close to subgrade elevation and three lines of perforated metal pipe backfilled with rock filter material will be installed in Elm Street. The grade lines will descend to the west, following the general slope of the underlying impervious stratum, to an area clear of the work where porosity of subsurface material will permit absorption of the underground flow.


STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS
MAP OF
CALIFORNIA
SHOWING
UNITED STATES AND STATE
NUMBERED HIGHWAYS
FEBRUARY 1953
Statute Miles
LEGEND
UNITED STATES HIGHWAYS - SIGNED
UNITED STATES HIGHWAYS - NOT SIGNED
STATE HIGHWAYS - SIGNED
STATE HIGHWAYS - NOT SIGNED
SAN FRANCISCO AND VICINITY
LOS ANGELES AND VICINITY
OREGON
NEVADA
ARIZONA
MEXICO
PACIFIC OCEAN
Revised February 3 1953

Early Days

Minutes of First Highway Commission In 1916-19 Make Interesting Reading

By R. C. (CASS) KENNEDY, Secretary, California Highway Commission

Continued from last issue

THIS STARTS the notes on the 1916 minutes of the California Highway Commission. Nothing much of interest happened during January and February, except on February 11th Commissioner Darlington suggested that the commission take steps to cause to be introduced a bill in Congress providing for governmental aid in the construction of a highway from Merced to El Portal. This evidently was the beginning of our Yosemite All-Year Highway which is now in existence. Later on, in February, the commissioners authorized the highway engineer to have prepared suitable motion picture films illustrating his state highway activities. The cost of these films was not to be more than $2,000, and were to be supplied, rent-free, to moving picture houses throughout the State.

Bridge in Humboldt

In March, the commission wrote a letter to the Board of Supervisors of Humboldt County in reference to a bridge to be built up there. The original estimate for the bridge was $40,000, which sum the commission agreed should be paid by the State. It was understood that Humboldt County would pay the entire cost of the structure in excess of the sum of $40,000.

The plans for the bridge had been prepared by the engineers and the estimate showed that the structure would cost more than $100,000. This cost was much in excess of any amount heretofore discussed with the board of supervisors, and the additional estimated cost was largely due to the extraordinary rise in the price of steel due to war conditions. It also appeared that because of the war the mills were so busy that steel deliveries were not promised earlier than the following October, with a chance of a much later delivery date.

Sold Steer Hides

In several places, I have noticed in going through these files that the commissioners were crediting money that they had received from the sale of hides, and I had no idea where the hides came from until the minutes of March 7th disclosed that the State Board of Control granted the necessary authority to the commission to sell hides at the best price obtainable. It seems that the commissioners were buying beef on the hoof for road construction crews. Naturally, as the steers were killed, hides accumulated, and the idea was that the commission would be allowed to sell them and credit the money to the Highway Fund.

There is a note in the May 13, 1916, minutes to the effect that the commission voted its sincere appreciation to the Causeway Celebration Committee. This was in connection with the ceremonies commemorating the completion of the Yolo By-pass Trestle, which work was completed on March 24, 1916, and the structure became known as the Yolo Causeway.

Speed of Autos Controlled

In May of 1916, the commission received a letter from the County Clerk of Marin County, requesting its cooperation in the matter of enforcing regulations controlling the speed of automobiles on state highways, this speed to be controlled particularly in the neighborhood of schools. There are further notes in the minutes of this same day suggesting that the commission call upon the proper authorities of the several counties to prosecute to the fullest extent the conspicuous violations of the state speed law incident to the various reported record auto runs between Los Angeles and San Francisco. The letter to the several district attorneys called attention to the Motor Vehicle Act, Section 22(a), prohibiting automobile road racing upon state highways except by specified permission of the state authorities. Also, that a provision of the act, Section 22(b), established a maximum speed limit of 30 miles per hour. The letter continued that it was a matter of press report that various road records had been made between Los Angeles and San Francisco over state highways since the passage of this resolution.

Just for the information of the younger generation, let me say that it was quite a feat in those days to drive from Los Angeles and San Francisco without having quite a lot of trouble. Different motor car dealers would pick out one of their better drivers, either a salesman or a mechanic, and work over a car until they got it in pretty nearly perfect condition. Then they would make arrangements for refueling it at different spots; then, would start out either from San Francisco or Los Angeles to find out how fast they could make it to the other city. Naturally, as soon as they did that, they had advertisements prepared and placed them in newspapers crowing about the speed and stamina of their car. This is what the California Highway Commission was taking exception to.

Early Road Signs

On June 7th, the commission voted that the B. F. Goodrich Company be notified that the precedent established by the commission demanding the removal of all advertising signs from the right of way of the California state highways had been, and would be, enforced without exception. And it further stated that the Goodrich road markers could not be given a special permit but that in recognition of the public service rendered by the Goodrich road markers, this company would be granted until December 1st to remove its signs. I don't know how many of my readers remember the signs of

the B. F. Goodrich Rubber Company. They were established along our highways and gave mileages to different towns, and of course, carried the advertising of the Goodrich Rubber Company. The thought of the Goodrich people at the time was that they were going to sign the entire United States with these signs, but they ran up against the same idea in several other states as they did in California, and finally gave it up.

County Contributions

There is one thing that I noticed in the minutes of June 26, 1916. There was a job to be done in Division IV in San Mateo County, and the commission was opening bids. The list of contractors and the amounts bid are listed in the minutes. One of these bidders was Eaton & Smith, of San Francisco. This same firm was allotted a contract in Plumas and Lassen Counties for some $400,000 the first part of April, 1952. Eaton & Smith still bid on state highway jobs.

In the minutes of June 27, 1916, I ran across this. It was voted that the various counties, obligated to contribute money to the State Highway Fund, for the construction of state highways or bridges, be requested to forward their contributions to the State Highway Fund as soon as possible.

In August of 1916, the Pacific Coast manager of the B. F. Goodrich Company appeared before the commission, requesting permission to repaint all of the company's signs on state highways. This would cover up the name of the Goodrich Company and all advertising features, and the signs would be donated to the State without cost. The commission advised the gentleman that its plans for a uniform system of signs on the state highways were determined upon and that it could not consistently consider the proposition.

Sign Order Modified

And then, in October, 1916, a notation appears in the minutes that the commission would not be in a position for some months to install upon the state highways the State's distance and directional signs. The commission decided, in order that the traveling public might not be inconvenienced by such delay, its previous order for removal of the Goodrich markers by December 1st be modified and that the markers might remain upon the state highways until further orders were received from the commission. At the same time, it denied the application of a Dr. Paul Bauer of Newhall, California, who owned White Sulphur Mineral Springs and wanted to erect certain road signs on portions of the state highway in Los Angeles County. But the commission said "No."

Now, in the old days, gasoline pumps were set out near the curb. We did not have what we now know as "Service Stations." So the commission passed a rule that in no case would pumps be permitted to be installed at any point nearer than 20 feet from the center of the state highway.

During the meeting of December 19, 1916, it was voted that Mr. Darlington be elected chairman of the commission. It was evidently the thought of the commission, being made up of only three men, that the chairmanship would rotate.

New Districts

By the time 1917 began, the commissioners evidently were surfeited with work and they thought it well to divide the State into three districts. These districts were for the commissioners alone. District I comprised the whole of Divisions I, IV, and V, with the exception of Santa Barbara County. This district was to be under the charge of Mr. Blaney, and Mr. Blaney was to make his headquarters and office in the Rialto Building in San Francisco. District II comprised the whole of Divisions II, III, and VI, with the exception of Kern, Mono, and Inyo Counties, and that was to be under the charge of Mr. Stern, with his headquarters and office in the Forum Building at Sacramento; and District III would comprise the whole of Division VII, together with Santa Barbara, Kern, Mono, and Inyo Counties, and was to be under the charge of Mr. Darlington, who was to make his headquarters and office in Los Angeles. It is further stated in the minutes that all transactions arising in any district, other than such as are purely routine, no matter by whom received or to whom presented, should be referred forthwith through the proper channels to the commissioner in charge of such district.

Commission Meetings Rotated

The commission also decided that there would be a stated meeting of the commission on Tuesday of each week—such meetings to be held in rotation in Sacramento, Los Angeles, and San Francisco. But it further stated that on the third Tuesday of each month the meeting should be held in Sacramento.

The minutes also state that each commissioner should remain in his district, to such extent as was necessary, and center his energies upon the work of his district, except that at all of the weekly meetings all questions, no matter where they originated, should be presented at the meeting for discussion and action. The weekly meeting was to be, in effect, the clearing house for all actions by the commission. The next day, on January 24, 1917, the commission voted that Commissioner Stern be designated to act as an auditing committee of one for and on behalf of the commission.

It would seem that the commission had ordered all electric power companies to take their lines off the state highway right of way. On January 24, 1917, there is record of a meeting with representatives of all the large power companies in the State together with the secretary of the Light and Power Association of California. These gentlemen asked that an opinion of the Attorney General of the State be obtained in the matter before the order would take effect. The gentlemen appearing had an opinion that there were good grounds for believing that the commission was exceeding its legal authority and arbitrarily determining what was a dangerous high-tension voltage. It was finally decided that Mr. Carleton, the attorney for the commission, and the Attorney General, would get together and decide on the legality of the question, later upheld by the Attorney General. This was the beginning of clearing the rights of way of the state highways of all poles and other pieces of equipment of public utilities.

New Commissioner

On March 6, 1917, the commission met in Sacramento, and there is a note

that a new commissioner, Henry J. Widenmann of Vallejo, appointed by Governor Johnson on March 1st to Commissioner Blaney, would be seated as a member of the commission. This was done.

In April, 1917, the commission discovered that it needed a steam shovel. Mendocino County had had a number of slides. A second-hand steam shovel was bought for $3,500.

Also, on April 3d, it shows that a J. W. Vickrey was employed as a transitman in Division I at $90 a month, with allowance for board and lodging. This same J. W. Vickrey is now Assistant State Highway Engineer in charge of planning, and his headquarters is in Sacramento.

In 1917, the first World War was on. At that time, the commission voted that deductions could be made from the salaries of various employees of the commission who had authorized it to make deductions to cover their subscriptions for Liberty Bonds on the employer's plan.

The commission had received a letter from Division Engineer Patch, recommending the installation of cast iron discs 12 inches in diameter and 6 inches high, painted white, at the center of the intersection of certain streets in Southern California. These were to serve the purpose of automatic flagmen. The commission approved this suggestion, but amended it to say the discs should not be over three inches high and of a diameter and design satisfactory to the Highway Engineer.

Feather River Highway

In July, 1917, the North Fork of the Feather River appears in the minutes. It seems that a joint committee of the supervisors of Butte and Plumas Counties was heard concerning a detailed examination for a state highway route in the canyon of the North Fork of the Feather River. The commission decided that the Highway Engineer should appoint one of the engineers of the commission to act with the engineers selected by the two counties, and that the dates of the examination were to be arranged by the three engineers so appointed. I hope my readers realize that the North Fork of the Feather River is where our present Feather River Highway is located.

At the meeting of July 26, 1917, the secretary read a letter from the Cotati Chamber of Commerce urging the early construction of the highway between Petaluma and Santa Rosa. The reason this question is brought up is that the people in that neighborhood are right now urging the commission to build a freeway between Petaluma and Santa Rosa as quickly as possible.

In September, 1917, the commission received a letter from the District Attorney of Napa County, concerning the necessity for a reduction in speed of vehicles on the state highway in the vicinity of the main entrance of the Napa State Hospital. So, the commission voted that the speed limit be reduced to 15 miles per hour.

In October, 1917, the Highway Engineer submitted forms of proposed warning road signs. The commission authorized him to order 100 of these signs. The signs were to be enameled on metal—white letters on a green background. This was probably the beginning of our road signs.

Wartime Shipments

During the meeting of November 1, 1917, the commissioners went into executive session with the Highway Engineer and the seven Division Engineers, the Purchasing Agent, and the Chief Geologist. They had the matter under consideration regarding the government's threatened injunction against the shipment of road-building materials by railroad freight cars. Spread on the minutes is a copy of the telegram sent to the State Council of Defense in San Francisco, and also to Robert S. Lovett of the War Industries Board in Washington, D. C., protesting against the idea of stopping shipment of highway and roadbuilding materials by railroad. A copy of both communications was forwarded to Governor Stephens, and his aid was solicited in trying to get the matter straightened out.

At the December meeting, the commission requested the attorney, Mr. Carleton, to prepare a digest of the Motor Vehicle Act and lay out the duties of the commission as defined by that act.

Also, at the December meeting, there was a letter received from the North-of-Bay Counties Press Association—in fact, there were two letters. These letters asked that the commission interest itself in removing signs from the state highway in Sonoma, Mendocino, and Humboldt Counties. This gets us pretty well through 1917; in fact, that is one of the last entries in the book for the year 1916.

Intersection Buttons

Starting the year 1918, the commission minutes are mostly devoted to routine business. The County of Orange had asked permission to set buttons at the centers of intersections of the principal paved county highways with the state highways. Where the county highways crossed the state highways the county wanted to set buttons of cast iron in the middle of the intersection. There is a drawing in pen and ink in the minutes of a cross-section of one of these buttons. They were to be 18 inches in diameter and 3 inches high and set on a one-inch bar of steel which was cast into the disc. This bar was to fit into the hole in the middle of the pavement and the button was to be in the center of the intersection. The buttons were to be painted white. A permit was issued for the installations of the buttons.

With World War I going on, there was trouble down at Camp Fremont on the San Francisco Peninsula. There is a letter from P. J. Tehaney, who was Acting Superintendent of the Motor Vehicle Department at the time. He forwarded a letter from B. H. Pope, the Provost Marshal of Camp Fremont, concerning the revoking of certain automobile and motorcycle licenses. It also asked for advice in the matter of placing signs at certain railroad crossings at the camp.

The secretary was instructed to refer Mr. Tehaney's letter and the enclosure to Attorney Carleton, and Mr. Carleton was instructed to consult with Mr. Tehaney directly and to arrive at an understanding with that official concerning all matters pertaining to the commission's functions under the Motor Vehicle Act.

It would seem that some soldiers stationed at Camp Fremont and some civilians were driving a little bit fast; the camp authorities wanted to slow them down when going by Camp Fremont.

Careless Drivers Cited

At the January 30, 1918, meeting, the commission received from the official reporter of the coroner's office in San Francisco a copy of a verdict in the case of a certain person who came to his death through an accident caused by the careless driving of an automobile by another person. This letter recommended that the driver's license be revoked by the proper authorities, and there were two letters again from the Motor Vehicle Department regarding two other infractions of the law. It was decided that all similar letters be referred to the attorney with the recommendation that the attorney prepare a report and the necessary blanks to govern the procedure of the commission in trying all cases of this character.

In February, another letter from Mr. Tehaney, Acting Superintendent of the Motor Vehicle Department, was read and his letter enclosed copies of letters from two people complaining against a driver of an automobile with a certain license number. It would seem that this person was accused of reckless driving. The letter was referred to the attorney with the request that a form letter be prepared in reply to this and similar complaints.

Prison Labor Camps

In the minutes of March 5, 1918, a couple of pages are used to report on a conference at San Quentin Prison. Two of the commissioners and the Highway Engineer representing the commission, and the Prison Board and Warden Johnston, sat down around a table and decided how they were going to run convict labor camps. It was agreed that thereafter the supervision and administration of the work in the prison camps would rest entirely in the hands of the Highway Commission and its representatives, and that prison representatives would no longer act as subforemen or in any other executive capacity with reference to the work of road-building. The prison representatives were to have exclusive control of the discipline of the prisoners, but were to limit their activities solely to this. It was also agreed that the commission's representatives should have the right to ask the return of any men to the prison for any reason that to them seemed sufficient. This request was to be made to the head guard and by him carried out. It was also agreed that the prison representatives would have the same right to return men for any cause that to them seemed sufficient; and it was also agreed that Mr. Fletcher, the Highway Engineer, and Warden Johnston, would keep each other closely informed of all administrative measures adopted by either.

Pasadena Bridge Speed Limit

The commission had received a letter from the City Attorney of Eagle Rock, California, which talked about the speed on the concrete bridge located on the main road between Eagle Rock and Pasadena. This concrete bridge was the old bridge that is still in use but is being replaced by a new bridge just east of it at the present time. Evidently, some motorists in Southern California were using the bridge as a speedway. The commission voted that the speed limit should be 15 miles per hour on the bridge.

At the May meeting, the Board of Supervisors of Santa Clara County requested and received permission to erect signs on the state highways at the various entrances into Santa Clara County. These signs and the locations were to be satisfactory to the Division Engineer. The wording was to be "*Welcome. Please help us keep our highways and byways clean of picnic refuse*," and was to be signed by the Board of Supervisors of Santa Clara County.

Improvement clubs, women's clubs, and other civic-minded organizations continually are writing in to the commission, even today, or to the State Highway Engineer, complaining of the rubbish-littered condition of highways in different parts of the State. The Division of Highways has tried in every way possible to alleviate this trouble and to do something about keeping our highways clean.

Pacific Highway

In July of 1918, a letter was received from Samuel Hill, of Seattle. He requested that the commission designate the Western Sacramento Valley Line as the Pacific Highway, and the commission proceeded to vote approval, and gave permission to the Pacific Highway Association of North America to sign the route, provided that such signs be in form and location satisfactory to the commission.

The minutes of July 17, 1918, also show that the commission had received an agreement with the United States Department of Agriculture regarding Project No. 7, the road between the city limits of Redding and Power House. This is a distance of 15.94 miles, known locally as the Weaverville Road in Shasta County. It is quite interesting. It was signed by A. B. Fletcher, Highway Engineer, and by Carl Vrooman, who was Acting Secretary of Agriculture.

In July, 1918, the offices in the Forum Building, Sacramento, were once more expanded for the Headquarters Office. It would seem from the minutes that the State Fish and Game Commission had three rooms on the fifth floor and the Highway Commission wished to expand on the fifth floor. There being no more rooms available, except the three held by the Fish and Game Commission, it was agreed that this agency would move down a floor and the Highway Commission would spend about $250 installing certain fixtures and floor covering to be the equivalent of what Fish and Game had up on the fifth floor.

At the October 30th meeting, there was spread upon the minutes a resolution regarding the death of Commissioner Widenmann. Mr. Widenmann had passed away on October 6th.

Commissioner Whitmore Seated

At the December 10, 1918, meeting, Charles A. Whitmore, of Visalia, presented his credentials as an appointee of the Governor to succeed Mr. Widenmann on the commission. Also, on December 10th, Assistant Secretary Helen J. Erway resigned, whereupon the commission appointed a new Assistant Secretary in the person of Mrs. Helen M. Davidson (nee Hawkins).

In December, Charles S. Stern decided he didn't have the time to give to the commission, so he resigned, and on December 30th Emmett Phillips, of Sacramento, presented his credentials to the commission as the new appointee by the Governor.

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Retirements *from* Service

On the occasion of his retirement from state service after 33 years with the Division of Highways, L. V. (Pat) Campbell was honored by associates and friends at a dinner at Hotel Senator on April 30th. For the past 20 years, Campbell has been Engineer of City and Cooperative Projects of the Division of Highways.



L. V. CAMPBELL—1953



L. V. CAMPBELL—1915

Pat was born in Louisville, Kentucky, and attended local elementary and preparatory schools in that city. He got his engineering education at Rensselaer Polytechnic Institute where he was a member of the Theta Nu Epsilon and the honor society of Tau Beta Pi.

After graduation in 1910, Pat returned to his native city and engaged in electrical power production. In 1912 he came to California and located in San Diego where he was employed on relocation and construction by the San Diego and Arizona Railway, and by local private firms. In 1915 he went to work for the California Highway Commission in the old Division III office in Sacramento.

Veteran of World War I

During the first World War he was a second lieutenant in the Engineer Corps. After receiving his discharge he was employed by the Sacramento County Highway Commission for two years as resident engineer during the construction of county highways by bond issue. Following completion of that work, he was employed by the Nevada State Highway Commission as office engineer for a year and one-half and by the Montana State Highway Commission as office engineer for one year. Returning to California in 1922 he was employed by the Cali-

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O. B. Brinkerhoff

O. B. Brinkerhoff, Assistant Highway Engineer with the Division of Highways District VIII Office at San Bernardino for 25 years, retired on February 28th.

Brinkerhoff served as resident and location engineer on many highway projects in District VIII, which includes most of San Bernardino and western Riverside Counties.



O. B. BRINKERHOFF

Brinkerhoff came to work for the California Highway Commission in 1922 as instrument man, and later assistant resident engineer, on various construction projects throughout the State. He resigned in 1926 to take a job with the Southern California Edison Company, but returned to the Division of Highways the following year, accepting employment with the San Bernardino Office where he remained until his retirement.

Brinkerhoff was born at Fort Scott, Kansas, in 1883. He attended public schools at Fort Scott and Compton, California, and continued his education at the University of Southern California Law School, graduating in 1904.

He began his engineering career in 1909 when he became a rodman on a survey party with Southern California Edison. He left the Edison Company in 1918 to work for the Sonoma County Surveyor's Office at Santa Rosa, remaining there until his appointment by the California Highway Commission four years later.

Brinkerhoff estimates that during his career he has supervised more than 300 miles of highway construction, most of it in District VIII.

L. H. Williams

L. H. "BILL" WILLIAMS, engineer in charge of the District XI Right of Way Engineering Department at San Diego, was honored at a surprise party in the district office on April 30th in recognition of his impending retirement after 38 years with the Division of Highways.

Williams came to work for the State as a chainman and rodman in District II at Dunsmuir on April 23, 1915, beginning a career that was to see service under four State Highway Engineers and was to take him on various highway assignments throughout the State from Tulelake to Calexico.

Williams' first field job with the State was as a concrete inspector under the late Spencer W. Lowden on the Shasta River Canyon Highway. In those days, Williams recalls, inspectors were required to walk to their jobs, and as this particular project was eight miles long his fondness for hiking was often put to the test. Williams further recalls that Mr. Lowden, as resident engineer, rated the only means of locomotion, outside of walking, that the camp could boast—a horse.

Under Jim Standley

In 1916, Williams returned to the district office as chief clerk, a post he held until 1921 when he became a squad leader under James G. Standley, who was then Chief Draftsman for the District.

In 1925, when the district headquarters moved to Redding, Williams was made inventory clerk, and came to be one of the first men in the State to put into effect the California Highway Commission numbering system for all equipment so familiar to division personnel today.

Two years later, Williams took over the right of way work for District II. At that time it was a one man department. It was up to him to figure descriptions, make his own calculations, write deeds, and then contact his prospective customers and get them to sign the deeds.

He returned to the field in 1930 to become resident engineer in charge of one of the early honor camps using prison labor, at Ingot east of Redding. After this he served as resident engineer on various jobs throughout the district, including highway construction projects at Alturas, Tulelake and Redding.

Transfers to San Diego

In 1937, Williams transferred to District XI at San Diego, and during the next 13 years supervised many major construction jobs in the southern part of the State, including the highway between Oceanside and Las Flores Creek, the La Mesa By-pass, the new highway at Fort Rosecrans, and the northern section of the Cabrillo Freeway.

He took charge of the District XI Right of Way Engineering Department in 1950.

Williams, who is married and has a son, was born in 1888 at Alhambra. He began his engineering career as a young man of 17 when he took a job as rodman and chainman doing subdivision work in Southern California, and it is from this period in his life that Williams has garnered one of his most valued memories. In 1906, he and another young surveyor were sent to the Palo Verde Valley to establish the boundaries of a 45,000 acre ranch and Williams can still tell you about sleeping on the ground around a campfire, of eating three meals a day which unvaryingly consisted of boiled beans, bread, syrup and coffee, and of killing anywhere from two to six rattlesnakes a day. But the thing that pleases him most is the fact that, as part of this job, they were to stake out 160 acres of sand and sagebrush along the Colorado River for a townsite. Those 160 acres, Williams adds, have since become the City of Blythe.

L. V. Campbell

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fornia Highway Commission in the Headquarters Office at Sacramento where he was soon appointed office engineer. He was in this position 11 years.

When the Legislature in 1933 allocated gas tax revenue for expenditure in cities, he was assigned the duty of organizing and conducting the Department of City and Cooperative Projects and has been in that position for nearly 20 years.

Worked for Retirement System

Pat was a member of a small coterie that worked hard and diligently towards securing a retirement system for state employees and was one of the group that obtained an appropriation from the Legislature of $5,000 to conduct a study and report for a

. . . *Continued on page 55*

Harrison Smitherum

Starting with the old State Water Commission as a member of a hydrographic survey crew in June, 1920, Harrison Smitherum, Supervising Hydraulic Engineer of the Division of Water Resources, retired on May 1st after 33 years of continuous state service.



HARRISON SMITHERUM

Smitherum was born in Johnsville, Plumas County, March 29, 1888. He moved to San Jose in 1895 and attended grammar and high school in that city. He graduated from Stanford University in May, 1911, with an A.B. in civil engineering. His first employment was on the construction of earth and oil storage reservoirs for the Associated Oil Company at Coalinga and Bakersfield. His next employment was with the Pacific Gas and Electric Company in charge of hydrographic work in connection with the hydroelectric system of that company. At the time of his retirement he was Supervising Hydraulic Engineer in Charge of Water Right Applications and Adjudication of Water Rights.

Smitherum is a life member of the Lake McArthur Water Master Conference, a coterie of ardent fishermen which calls its shack at Lake McArthur "The County Club." Smitherum intends to spend a great deal of his time at the club and on trout streams in the Sierras.

George M. Webb in Post of Highway Traffic Engineer

STATE HIGHWAY ENGINEER GEORGE T. MC COY on May 1st appointed George M. Webb as Traffic Engineer for the State Division of Highways. He succeeds E. T. Telford, recently transferred to Los Angeles as District Highway Engineer.



GEORGE M. WEBB

Webb, who has specialized in traffic engineering and highway planning work for the Division of Highways since January, 1942, had previously served as acting traffic engineer for a one-year period. Since March of last year he has been assistant planning engineer.

His latest promotion came on the eve of this twenty-fifth anniversary of service with the Division of Highways. He joined the division as an instrumentman in the summer of 1928 after nine years of highway experience in his native State of Oregon. His initial California assignment was on the Feather River Highway project, and he supervised heavy grading and tunnel work on that route in the course of the next several years.

His subsequent experience included work in the Bridge Department Office at Sacramento and in District I, northwestern California, where he was engineer in charge of city and cooperative projects.

Webb's 11 years of work in the Traffic and Planning Departments at

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Fred Bagshaw Is New Assistant to Director Durkee

APPOINTMENT of T. Fred Bagshaw, Mill Valley, to be special assistant to the director, was announced on May 1st by Director of Public Works Frank B. Durkee.

Bagshaw fills a vacancy which had existed since September 28, 1951, when Robert M. Shillito resigned. He has been well known in public life in California for many years. He was chairman of the Marin County Board of Supervisors for 14 years prior to his retirement on January 5th, last. He is a former Mayor of Mill Valley, a Director of the Golden Gate Bridge and Highway District, and has been active in the Redwood Empire Association, the State Supervisors Association, and the California State Chamber of Commerce. He formerly owned and published the *Marin Journal* in San Rafael.



T. FRED BAGSHAW

C. E. Bovey Named To Post Vacated By L. V. Campbell

STATE HIGHWAY ENGINEER GEORGE T. McCOY on April 30th announced the appointment of Clarence E. Bovey as City and Cooperative Projects Engineer of the Division of Highways to succeed L. V. Campbell, who retired on the same date.



C. E. BOVEY

Bovey was Assistant District Engineer in charge of administration for District X at Stockton, which includes a number of central California counties. His new headquarters will be at Sacramento.

Bovey has been with the Division of Highways for 39 years, having gone to work in March, 1914, as an engineering draftsman in the Sacramento office.

During the succeeding four years he served as transitman on surveys and as assistant resident engineer on highway projects in central California. From 1918 to 1924 he was resident engineer in charge of numerous grading and paving projects, including ones in Yolo, Stanislaus and Yuba Counties. In 1926 he became Maintenance Engineer for District X with headquarters in Sacramento, and moved

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Safety Council Program Stresses Highway Needs

ADEQUATE HIGHWAYS, to relieve congestion and keep pace with increasing motor vehicles, rank first on the 1953 program of California Safety Council, declares George Hoberg, president.

California cannot afford inadequate



GEORGE HOBERG

highways or inadequate highway financing, Hoberg says, pointing out that:

(1) Seventy percent of California's annual 3,650 traffic fatalities and $300,000,000 economic loss due to traffic accidents occur outside incorporated city limits.

(2) All major industries in the State's $20,000,000,000 economy are dependent on highway transportation—manufacturing, agriculture, mining and oil, forestry and fishing, and the tourist industry.

Hoberg has been one of California's most active citizens in promoting highway improvements since the 1930's. Engaged in the resort business in Lake County, he was President of Lake County Chamber of Commerce 1931-1935, Director of Redwood Em-

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State Works Chief Addresses Safety Awards Conference

REPRESENTATIVES of 40 cities and counties, mostly from Northern California, gathered Thursday noon, May 14th, at the Palace Hotel, San Francisco, for the Nineteenth Annual Awards Conference of California Safety Council.

Principal speaker on the program was Frank B. Durkee, State Director of Public Works, who discussed "Building Safety into California Highways."

Oakland and San Francisco head the list of Safe Cities Awards, presented by George Hoberg, president of California Safety Council, who acted as chairman.

Oakland is winner of the annual Safe Cities Sweepstakes Trophy for the best record among all cities in reducing motor vehicle accident fatalities with a saving of 29 lives during the previous year, while San Francisco has the best record among cities over 500,000 population with 21 lives saved.

Orange County is the winner of the Safe Counties President's Trophy for the best record of reducing motor vehicle accident fatalities outside city limits with 26 lives saved.

Alameda County was awarded first place among counties over 500,000 population with eight fewer fatalities during the year, while Santa Clara, Contra Costa, San Joaquin, San Mateo, Tulare and Marin won recognition among counties in other population groups. Additional awards were made to Ventura, Humboldt, Mendocino, Inyo, Mono, Placer, Siskiyou, Colusa, and Modoc Counties.

Perfect records of no traffic fatalities for the year won Safe Cities Awards for the following cities: Whittier, Ventura, Maywood, San Bruno, Chico, Watsonville, Hermosa Beach, Santa Paula, Madera, Santa Maria, Redding, Orange, Hanford, Pacific Grove, Woodland, San Anselmo, El Monte, Sierra Madre, Mill Valley, Porterville, Concord, Claremont, Mountain View, Escondido, Sanger, Calexico, Turlock, Ukiah, Chino, Wasco, Coalinga, Oroville, Grass Valley, Los Gatos, Red Bluff, Auburn, Livermore, Carmel, La Verne, Reedley, Blythe, Exeter, Fairfax, Oakdale, Needles, Glendora, Covina, Taft, Arcata, Davis, Seal Beach, Hillsborough, Hemet, Yreka, Brea, Vacaville, Rialto, Fairfield, Gridley, Willows, Port Hueneme, Atwater, Bishop, Emeryville, Alturas, Clovis, Sebastopol, and Woodlake.

Other Northern California cities to receive awards include: Stockton, Richmond, Burlingame, El Cerrito, Eureka, Hayward, Pittsburg, Millbrae, North Sacramento, and Manteca.

Veteran Employees Given Awards for 25 Years of Service

UPON the occasion of the spring dance of the California State Employees' Association at the Hollywood Palladium on the evening of May 7th, certificates and pins were presented to 19 employees of District VII, Division of Highways, in recognition of 25 years of service with the State of California as of December 31, 1952. A gathering of about 1,000 state employees and their friends was presided over by James H. Anderson, Regional Director, Region XI, of the C. S. E. A. Anderson introduced P. O. Harding, Assistant State Highway Engineer in charge of District VII, who made the awards. Harding was assisted in the presentation by Mr. Fred L. Everett, District VII Office Engineer.

The awards were made to the following: Emmett Bush, Mark E. Cessna, Elvira Cochran, Roy M. Cooley, Frank B. Cressy, Mary C. Dougherty, Charles C. French, Basil N. Frykland, Charles L. Gildersleeve, James E. Hefferon, Charles J. McCullough, Howard F. Meinke, William E. Melcher, John O'Malley, Ernest R. Scott, Eugene Sorin, Ruby B. Trenholm, Hugh Truesdale, Harry H. Wildy.

It is interesting to note that the service record of these 19 employees totals 494 years, 9 months, and 4 days, of which 323 years was in the service of District VII of the State Division of Highways.

BASIC PHOTOGRAMMETRY FOR HIGHWAY ENGINEERS

By REX H. FULTON, Senior Highway Engineer

THE POPULAR conception of a highway engineer is a rugged individual dramatically posed on a cliff peering through a transit while holding a blueprint. We know that the transit and blueprint are important engineering tools but they are only incidental to the over-all objective.

Likewise, aerial photographs are immediately apparent or spectacular and, although essential, they are somewhat incidental to the over-all objective. *The most important use of photogrammetry in highway work is for production of large-scale contour and planimetric maps for expediting highway location and design.*

Aerial photogrammetry has been successfully used for reconnaissance, location and design of highway improvements; ascertaining drainage areas, location of structure sites, preparation of right of way maps, soil investigations, traffic studies, and in conjunction with project reports and public hearings. Perhaps no other engineering field can be benefited more by aerial photogrammetry than highway engineering.

At the present time, practically all photogrammetric work for the California Division of Highways is let to contract with private concerns. Highway photogrammetry usually takes the form or a strip along a proposed highway route. The component part of photogrammetric work as employed by the California Division of Highways is discussed under the following topics:

Aerial Photographs

Vertical aerial photography may be classified in general as follows: (1) stereo-plotting, used in devices for plotting topography and (2) geographic, used in making mosaics. Both are taken with a forward overlap of about 60 percent and can be used in a stereoscope. These two types of photography differ in their special purpose requiring different focal length cameras and usually different flight scales.

Cameras with focal length of 6″ and 8¼″ are usually used for stereo-plotting work on contour maps and are flown at scales of from 1″ = 200′ to 1″ = 800′. For mosaic work the focal length is usually 12″ and 24″ with flight scales of from 1″ = 400′ to 1″ = 1,600′. The reasons for this are apparent from the following illustration:

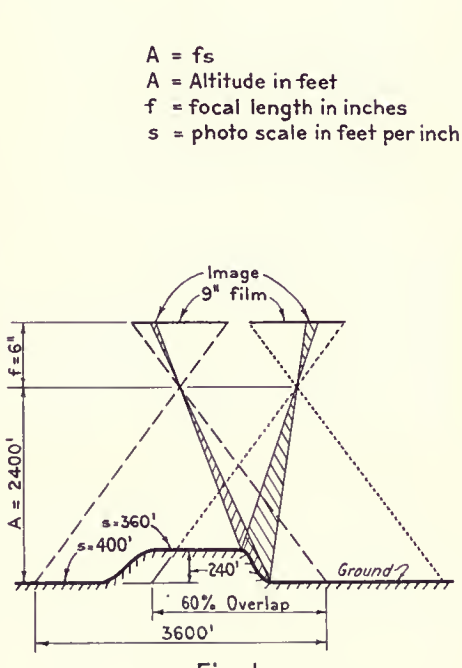


Fig. 1

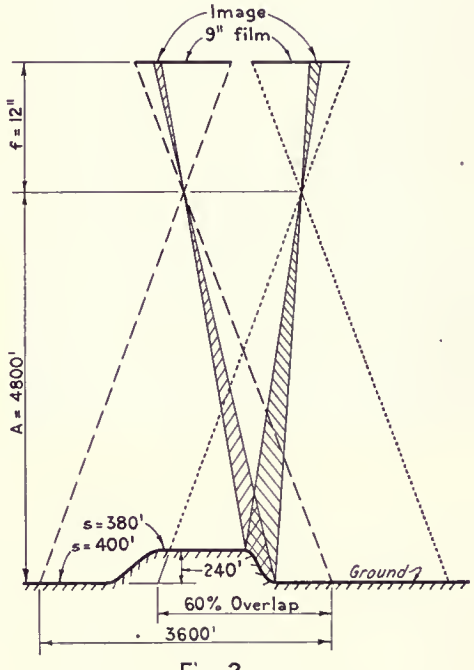


Fig. 2

Figure 1, above illustrates that a 6″ focal length lens results in wide angle photography and has a tendency to get a side view of ground objects which brings out depth in a stereoscope. The flight altitude is one-half of that required for a 12-inch lens to produce the same photo scale. Please note the hillside in the left image will occupy a narrow band on the photograph, while the same hillside in the right image will occupy a wide band on the photograph (known as parallax). This is the main reason that photographs taken with short focal length cameras will not lay down accurately in assembling mosaics.

Photo Scale

From the simple formula A = fs, representing altitude, focal length, and photo scale, it is apparent that photo scale is directly proportional to differences in ground elevation. In *Figure 1*, a difference of 24 feet in mean ground elevation results in a 1 percent difference in photo scale, and a difference of 240 feet elevation (rolling terrain) results in a 10 percent difference in photo scale. This is another prime reason why short focal length pictures are not suitable for assembling into mosaics. In stereo-plotting work, however, it is parallax and vertical displacement in scale that makes vertical measurement possible.

Figure 2, the 12″ lens camera indicates relatively narrow angle photography resulting in only 50 percent of the parallax and distortion obtained in 6″ lens camera. A 24″ lens camera results in a corresponding reduction

to 25 percent of the parallax and distortion of the 6″ lens camera.

It naturally follows that the higher the altitude at which pictures are taken, the less distortion in scale. This again is dependent on the type of camera, the purpose of the photography, and keeping the scale within practical limits.

When used as a map for horizontal measurement, vertical photography is subject to inaccuracies due to tilt, lens distortion, film and paper distortion and shrinkage, displacement due to difference in elevation, parallax, and variation in scale. The principal source of such inaccuracies is tilt of the plane or camera at the time of film exposure. Tilt can be rectified after film exposure with special equipment and ground control.

It should be borne in mind that certain inaccuracies which are apparent when the photograph is used as a map, are an indispensible necessity for stereo-plotting.

Contact Prints

Contact prints are made by direct contact with the original flight negatives which are usually taken with 60 percent forward overlap. Contact prints result in a minimum loss of detail, however, inaccuracies due to tilt and variation in scale are uncorrected.

Enlargements

Enlargements are made by projecting the negatives on sensitized paper or film and may be enlarged to four diameters without appreciable loss of detail. Maximum enlargement is about six diameters, although eight diameters has been successfully used. Nonratioed enlargements increase the print size without much regard to exact scale. Ratioed enlargements are made to a fixed scale determined from ground measurements. Such enlargements are subject to the inaccuracies outline under aerial photographs. A minimum error of 1 percent for any sizable portion of the photographic enlargement is costly and difficult to obtain.

Photo-Index

Photo-index is a simple type of mosaic used as an index reference and is made by stapling contact prints laid down in correct position like shingles. It is then photocopied and reduced in scale about three diameters.

Mosaic

A mosaic is an assembly of aerial photographs into a composite picture. Accuracy ranges from a simple lay-down of enlargements to a highly controlled mosaic, depending on the accuracy required. Do not expect too much accuracy from mosaics. Such accuracy is at its best in flat terrain and at its worst in rough terrain. Photography taken with a focal length camera of less than 12 inches adds greatly to the mismatch of mosaics.

Mosaics have found considerable use as displays at public hearings and for reconnaisance. A simple lay-down mosaic will usually suffice for these purposes. Good controlled mosaics cost about $500 per strip mile and still require conventional ground surveys for right of way and design data. Where accuracy is required, a better solution is a controlled contour map or a planimetric map, supplementing enlargements or a simple mosaic.

Because of the many variables involved, it is difficult to write specifications for mosaics and obtain a product within practical price consideration. In order to simplify results and cut costs, it is sometimes preferable to photograph the entire width of strip in one flight line using small-scale photography and obtain enlargements by projection; that is pass the light through the negative. A 4 to 6 diameter enlargement will result in a picture from 36″ to 54″ square which can be used in lieu of a mosaic, or by joining two alternate (every other) enlargements, with 60 percent overlap between adjacent exposures, a satisfactory mosaic 64″ to 97″ long can be obtained.

Enlargement by projection loses a minimum of detail, whereas enlargement by photocopying, as required in preparation of regular mosaics, results in a loss of considerable detail. For this reason photocopying is usually restricted to a three diameter "blow-up."

A simple mosaic using photo enlargements will suffice for displays and reconnaissance. Whenever a better map is required for location or design purposes, consideration should be given to a planimetric or contour map.

Contours and Planimetric Maps

Contours and other topographic features are plotted from aerial photographs by means of stereo-plotting instruments onto a skeleton map or grid. The skeleton map is controlled by second-order triangulation survey at an accuracy of 1 in 10,000 and is tied into the California Coordinate System. This accuracy is desirable for two reasons:

1. When each photographic model is picture pointed and plotted on the skeleton grid, it will fit precisely and independently in true position.

2. The entire finished map may be utilized as a preliminary survey whereby survey lines may be calculated and quantities estimated therefrom.

In aerial contour work, approximate costs may be broken down as follows:

Aerial photographs	7-15%	say 10%
Ground control		say 50%
Plotting, compiling and drafting		say 40%
Total		100%

An aerial planimetric map is made in the same manner as a contour map, except that the contours and spot elevations are omitted. Such maps are used as an adjunct to the contour map for right of way work, for detailing portions of the plans where contours only clutter up the work, or in flat valley areas where contours are so far apart as to be meaningless.

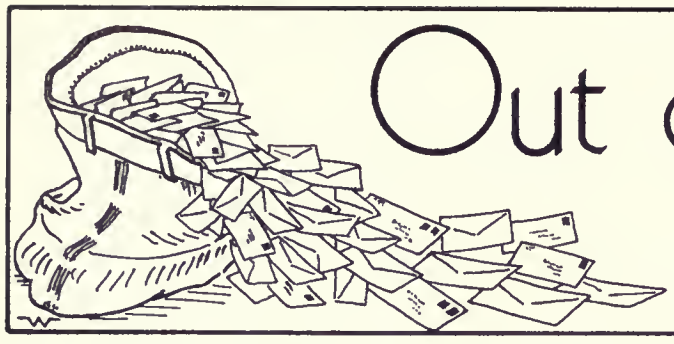
The Kelsh Plotter

Plotting of planimetric or contour maps is accomplished by means of instruments such as the Kelsh Plotter. One set of two pictures with about 60 percent overlap is called a model. Each model requires a minimum of two horizontal points to establish its position on the map and three vertical points to establish it as a plane, although more points are desirable. Such points are often chosen in common with more than one model.

Contour maps should be in scale relative to the contour interval. Although "C" factors * (relation of flight altitude to contour interval) usually control the contour interval, it is often the scale of the map that becomes the controlling factor rather than the contour interval.

* "C" factor of 1,000 means that if flight altitude is 5,000 feet, the contour interval cannot be less than 5,000/1,000, or 5 feet.

. . . Continued on page 59



Out of the Mail Bag

MANY THANKS

2321 Ward St., Berkeley

Mr. Kenneth Adams, *Editor*

Dear Mr. Adams: I receive much pleasure and valuable information from your magazine. Since I have in the past edited small publications myself, I know that you are probably quite eager to receive comments from your readers. Let me tell you therefore that I can find nothing to complain about in the contents or presentation of the material. I have yet to find another publication which can compete in your field.

Once more, many thanks for bringing such a fine magazine to the engineering profession and to the State of California.

Sincerely yours,

Wolfgang S. Homburger
Construction Engineer
U. S. Army, Corps of Engineers

FROM WISCONSIN

THE UNIVERSITY OF WISCONSIN
University Extension Division

May 7, 1953

California Highways and Public Works

Gentlemen: You have been kind enough to send us *California Highways and Public Works* regularly for some time now. We want you to know that we greatly appreciate this courtesy and that we make very good use of the publication. Please continue to send it to us as long as you find it possible to do so.

Very sincerely,

(Mrs.) Gladys Trayser
Administrative Assistant

MAGAZINE USED IN CLASSROOMS

LOS ANGELES CITY HIGH SCHOOL DISTRICT
Manual Arts High School

Los Angeles 37, California

Mr. K. C. Adams, *Editor*

My Dear Mr. Adams: After 32 years teaching history and government at Manual Arts, I am retiring this June. I want you to know my high regard for your able editing of the highway magazine and that the copies sent to the school have been used by the students in understanding our highway problems. I have been on the mailing list since 1932 when my good friend and neighbor, Jack Howe, started me out.

Will you please continue our school on the mailing list and send copies to Mrs. Genevieve McDermott. Thank you very much.

Sincerely yours,

Robert S. Maile

FROM SAFETY COUNCIL

EASTBAY CHAPTER NATIONAL SAFETY COUNCIL
Oakland 12, California

May 12, 1953

Mr. Kenneth C. Adams, *Editor*

Dear Mr. Adams: We would appreciate receiving a copy of your publication as issued. I had occasion recently to see it for the first time and realized its value to us in our work.

My congratulations to you on its excellence.

Sincerely,

Clinton W. Dreyer
Managing Director

Traffic stripes were painted on 11,500 miles of state roads by the California Division of Highways during the last fiscal year.

OF VALUE TO UNIVERSITY

UNIVERSITY OF SOUTHERN CALIFORNIA
Los Angeles 7

March 14, 1953

Mr. G. T. McCoy, *State Highway Engineer*
Department of Public Works
Sacramento 7, California

Dear Mr. McCoy: This will acknowledge with sincerest appreciation the receipt this date of a copy of the "Anderson Study," by John F. Kelly, Headquarters Right of Way Agent. As a great admirer of the excellent work you are doing, I want you and your associates to know how much I appreciate the sincere cooperation which I have always received from your staff.

The Anderson Study—an economic study of the effects of freeway construction, including frontage road, through the town of Anderson in Shasta County, California, is an excellent piece of work. It is most informative and should prove a most valuable teaching aid in highway transportation courses offered by the Department of Transportation, University of Southern California.

Again, do I wish to thank you, Mr. McCoy.

Sincerely yours,

Samuel Rubin
Head, Department of Transportation

The recent Annual Report of the California Division of Highways reveals that on November 23, 1951 (the day after Thanksgiving), a total of 102,613 vehicles crossed the San Francisco-Oakland Bay Bridge to establish a record for a single day's traffic which still remains unbroken.

TURKISH CORRESPONDENT

ZIYA GARMAR
BRIDGE DESIGN DEPARTMENT
GENERAL DIRECTORATE OF HIGHWAYS
Ankara, Turkey

March 30, 1953

MR. KENNETH C. ADAMS, *Editor*

DEAR SIR: After returning to my country, almost three months ago, I recently received a copy of *California Highways and Public Works*. It will be an expression of my feelings to say that your magazine is a pleasure to read and absorb, its widespread distribution makes a valuable contribution to better world relations.

During my visit to the U. S. A. for nine months all American people whom I met have shown a sincere interest in me and my work. Because of my position as a bridge engineer with the Turkish Highway Department, Bridge Section, the purpose of my visit to the United States was to observe and bring to Turkey the American advanced methods of bridge design and construction. At the same time, I had the time to observe America and become acquainted with American people and their way of living.

The reality of your progress in highways and all kinds of public works is very stimulating. I can say that *California Highways and Public Works* is one the most most profusely illustrated highway magazines I have ever seen and has so many articles on advanced methods of bridge and highway constructions which are already in actual practice.

I spent five months in California, I was very much interested in seeing the improvements and advances which are being made over there.

As I understand it, you Americans have been kind enough to place my name on your mailing list for *California Highways and Public Works*.

I would like to express my appreciation for your kindness in mailing us the January-February issue of your useful magazine. I have always found it extremely helpful and I would be pleased to continue receiving future copies. Thank you very, very much.

Yours very truly,

F. CAHMAH

Ford at Fifty in Words and Pictures

FORD AT FIFTY, a picture story of the automobile industry, an industry that directly or indirectly provides Americans with one out of every seven jobs in the Country, published by Simon and Schuster, as part of the Ford Company's fiftieth anniversary observance is of interest to Sacramentans. It is an intimate portrait of the automobile industry, the people who make it work, and its effect on America, told in terms of one company.

"The growth and achievement of Ford Motor Company have been made possible by the kind of America in which we live," says Henry Ford II. "While this is a portrait of an American industrial enterprise taken in its fiftieth year, it is also a look at America and people at work."

The story opens with an informal camera-and-text study of the changes the automobile has brought since 1903 to a typical American town, Sacramento, California. There, "an American revolution" has resulted in one automobile for every 1.6 residents, created curb service at restaurants, banks, libraries, and the post office, and has broadened trade areas for local merchants.

The book then turns to Henry Ford, "a man and an idea." The origin and fabulous growth of Mr. Ford's automobile manufacturing system is told through anecdotes and pictures, including a painting by Norman Rockwell.

George M. Webb

Continued from page 50 . . .

division headquarters in Sacramento was interrupted for two and one-half years during World War II when he served in the Army Transportation Corps with the rank of captain.

Webb is a member of the American Society of Civil Engineers and of the Institute of Traffic Engineers.

He is married and lives at 778 Perkins Way, Sacramento.

Cost Index

Continued from page 40 . . .

during the coming construction season.

The Engineering News-Record Index is 242.7 (1940 = 100) for the first quarter of 1953 and the Bureau of Public Roads Composite Mile Index was 245.8 (1940 = 100) for the fourth quarter of 1952. Many economic pointers are indicating a slight drop or at least a leveling-off in prices at the present time; however, with increases in the average prices in California of such major items as plant-mixed bituminous surfaces, structure concrete, and steel during the first quarter of 1953, it is thought that the 3.5 percent drop in the California Highway Construction Cost Index is not a firm indication of a general drop in construction costs.

In addition to the accompanying chart showing the Engineering News-Record Construction Cost Index, the U. S. Bureau of Public Roads Composite Mile Index and the California Highway Construction Cost Index there is shown a tabulation of the average unit prices by years and quarters for the eight basic items on which California index is based and a tabulation of the average number of bidders on various sized contracts for the last six months of 1952.

L. V. Campbell

Continued from page 49 . . .

State Employees' Retirement System. Upon receiving a favorable report, the Legislature submitted the question to the people by referendum. Pat was a member of the campaign committee on the referendum and was instrumental in persuading Tom Stanton to accept the chairmanship of the committee which he guided so ably to a successful conclusion. After completion of the election campaign, he was active in the organization of the California State Employees Association, being a delegate to the first meeting of the general council.

Campbell has two children, a daughter, Mrs. Eugene M. Gray, who resides in Sacramento, and a son, Lawrence P. Campbell, who is in the export-import business in Germany.

HIGHWAY PIONEERS INDULGE IN REMINISCENCES

RECENTLY, three gentlemen in Los Angeles were reminiscing about early highway construction in Southern California. They are: Spencer Cortelyou, who started to work for the Division of Highways on February 1, 1912, and retired on October 1, 1949, as Assistant State Highway Engineer; C. P. Montgomery, who entered state service with the Division of Highways on February 12, 1912, and retired on March 1, 1952; L. L. Rogers, who was with Rogers Brothers Company, General Contractors, in 1912.

Rogers and Cortelyou had some old-time pictures. The accompanying photo shows the three men gathered around a table and all talking at once about some of the pictures. Their tales of the trials and tribulations of building highways back in 1912 took up most of the afternoon.



Pioneer highway builders look at old photographs. Left to right, Spencer Cortelyou, C. P. Montgomery, L. L. Rogers.

Rogers Gets First Contract in South

Rogers Brothers Company received the first contract let in Southern California by the original Highway Commission in the early part of 1912. The contract called for building a state highway from the northern city limits of San Diego to Cardiff. And, according to Rogers, it cost in the neighborhood of $5,800 per mile. Any highway contract that was anywhere near $10,000 per mile was not let. New specifications were written and new bids asked for—and received.

There were five of the Rogers brothers in the original company: H. H., Geo. A., Bob, Tom, and L. L. All of them have died with the exception of L. L.

The second contract in Southern California was from the then northern city limits of Los Angeles on Ventura Boulevard to about where Studio City is now located. Montgomery was Assistant Resident Engineer on that project. As Cortelyou was Assistant District Engineer at the time he remembers both of the jobs.

Fifteen-foot Roads

"In those days," said Cortelyou, "we were building concrete roads 15 feet wide and 4 inches thick. Our mix was one part of cement, two and a half of sand and five parts gravel with enough water to mix it. Rather haphazard when you think of the specifications of the present-day roads.

"Practically all our roads cost less than $6,000 per mile. But I still think that A. B. Fletcher, the first Highway Engineer, had the nucleus of the right idea regarding roads. In those days the Highway Commission had very limited funds and Mr. Fletcher was trying to inform the people of California what good roads would mean to them. As a consequence, miles of narrow roads were built. They were not particularly narrow for that day, as our speed limit was 30 miles per hour for automobiles and 15 miles per hour for trucks. And, incidentally, all trucks had solid rubber tires in those days.

"Even then we were testing the concrete for its breaking strength," continued Cortelyou. "After we had built a road we would dig a hole under it and set up levels and transits and then drive loads over the small section to measure the deflection. In order to really cause the concrete to fail we finally had to concentrate the load on a two-inch by four-inch piece of wood in order to get a sudden failure."

Contractors Had Troubles

"Yes, and all the time you engineers were specifying concrete high-

ways we contractors were having our trouble," said Rogers. "The new concrete mixers we had didn't have any mechanical means of loading the darn thing. We had to do it with wheelbarrows. We built a runway to our first mixer and then found that we had to have two men to help the wheelbarrow man get up the incline with a load. It wasn't long before we managed to get some ship's timbers of decent length and make a runway that was more gradual.

"And another difficulty we had was trying to save our cement sacks. The water inlet for the mixer was directly over the mouth of the mixer. Try as we would we could never dump a sack of cement into the mixer without getting the sack wet. And wet sacks could not be turned back for credit to the cement company."

According to Rogers, he accepted a position with the Lakewood Engineering Co. after World War I. He traveled over most of the United States for them. At one meeting in New Jersey, Rogers remembers a statement made by one prominent engineer to the effect that people in that room would live to see the day when our highways would cost $100,000 per mile.

No Superelevation on Curves

About this time Montgomery told of the strictness of Fletcher, our first Highway Engineer. It seems that Fletcher specified that there would be no superelevation on any curve. None of the men in the field could figure out why this rule had been made and all tried, in one way or another, to give a little superelevation on the curves. On the Ventura job that "Monty" was on he was sticking in a slight elevation on the outside of curves. Fletcher came by making an inspection trip and noticed it. "Monty" says that Fletcher didn't say a word to him but went right to the Resident Engineer and read the riot act.

Spencer Cortelyou told of some of the experiences of building the Ridge Route. According to Cortelyou, there was one camp on one of the jobs that had a cook who was quite a trapper. Seems that the cook got so intrigued with the trapping country that he put out a line of traps and caught fox. This was done in his spare time. Cortelyou then said he remembered that some of the furs were sold to make a fur-lined coat for Governor Hiram Johnson. A reproduction of a letter regarding this coat is shown and reveals that $175 was paid for Castaic furs.

R. C. KENNEDY

Commissioners
Chas. D. Blaney, Chairman
Charles F. Stern
N. D. Darlingtan

Highway Engineer
Austin B. Fletcher
Secretory
Wilson R. Ellis

State of California
DEPARTMENT OF ENGINEERING
CALIFORNIA HIGHWAY COMMISSION
Forum Building, Sacromento

January 12, 1917.

MR. A. B. FLETCHER, *Highway Engineer*
Sacramento, California

DEAR MR. FLETCHER: I herewith submit statements of moneys collected and disbursed, account of the fur coat presented to Governor Johnson by the officers and employees of this commission:

Contributions Received

Mr. Blaney	$10.00
Mr. Darlington	10.00
Mr. Stern	10.00
Mr. Fletcher	15.00
Mr. Ellis	10.00
Mr. Winslow for Headquarters	57.00
Mr. Somner for Division No. I	30.00
Mr. Bedford for Division No. II	25.00
Mr. Caruthers for Division No. III	53.00
Mr. Clark for Division No. IV	35.00
Mr. Howe for Division No. V	35.00
Mr. Woodson for Division No. VI	20.00
Mr. Patch for Division No. VII	30.00
	$340.00

Disbursed

Paid Williams & Berg's bill	$65.00
Paid E. J. Evans for furs and making	100.00
Paid for Castaic furs	175.00
	$340.00

Respectfully,

W. R. ELLIS, *Secretary*

Safety Council

Continued from page 51 . . .

pire Association since 1935 and President 1943-1946, and Director of California State Chamber of Commerce 1939-1944. In addition, he was President of California Resort Association 1936-1942, Director of California State Hotel Association since 1942, member of the California Centennials Committee, and formerly a Vice President of California Safety Council. In 1944 he was appointed by Governor Warren to the State Water Resources Board.

Working with Redwood Empire Association, he has supported projects for elimination of hazardous conditions on highways. These have included safety lighting, traffic signals at hazardous rural highway intersections, passing zones for trucks on mountainous roads, channelized and divided highways, and elimination of curves.

Vice presidents of California Safety Council for 1953 include: Paul Dietrich, Los Angeles; O. L. Gray, San Francisco; George A. Scott, San Diego; Judge Daniel R. Shoemaker, San Francisco; and Dr. Robert Gordon Sproul, Berkeley.

Gas Tax to Cities

Review of Laws and Rulings Governing These Allocations

By L. V. CAMPBELL, Engineer of City and Cooperative Projects *

This is the third and concluding installment of Mr. Campbell's article.

A traffic lane 11 feet wide is recommended for traffic densities less than 200 vehicles per hour, but I doubt if there are many city streets with such low traffic densities. In highly developed districts, where an additional width of four feet for the traveled way would run into exorbitant amounts for right of way, traffic lanes 11 feet wide would provide an acceptable compromise. For two-lane streets 12 feet should be the absolute minimum for a traffic lane as with the above clearances the left side of the moving car is 18 feet from the curb. This leaves only 2 feet clearance to the center of the street which provides very little latitude for maneuvering or eccentric driving. The expediency of reducing the width of parking lanes to seven feet does not result in any additional width for moving traffic. A parked car takes up so much space and it will take the same amount of space whether the parking lane is painted seven feet wide or eight feet wide. Drivers just will not drive too close to a line of parked cars. So when the parking lanes are designated seven feet wide in order to show 11 feet or 12 feet for the traffic lane nobody is being kidded as to how much width the moving traffic is going to have.

In an article published in Western City a number of years ago, I compared the clearance between passing cars centered in lanes 10 feet wide with the clearance provided on railroads. This comparison was to the disadvantage of the highway although railroad trains cannot deviate from a fixed course while automobiles are free to wander from one side of the road to the other.

Maintenance and Construction

With the allocation of gas tax funds specifically for maintenance of city streets separately from the funds allocated for construction of major city streets, it became necessary to recognize the distinction between construction and maintenance. Maintenance is defined in Section 27 of the code. A copy of this section is contained in the Manual of Instructions. The definition seems to be clear enough and generally we find no misunderstanding on whether any particular work should be classed as maintenance or construction, except in a case of pavement surfacing. Resurfacing may vary from extremely thin blankets which are clearly a repair operation to the placing of heavy one- or two-course construction over the existing pavement so as to withstand a heavier load than the original pavement was capable of carrying. The department had sometime previously found it necessary to define a line of demarcation between maintenance and construction when resurfacing was involved. The policy adopted by the State Highway Engineer is that resurfacing 1 inch or less in thickness will be classed as maintenance. Resurfacing 1½ inches or more in thickness will be classed as construction. There is a hiatus between 1 inch and 1½ inches, the determination being made in headquarters. I might interpose here that there is not complete agreement in headquarters as to the proper thickness for the line of demarcation between maintenance and construction.

Resurfacing Ruling

With the passing of the Collier-Burns Act, cities became concerned as to what thickness of resurfacing would be considered maintenance and what thickness construction. The department ruled that a thickness of 1½ inches or less would be considered maintenance. I do not recall any objection to the 1½ inch thickness being raised by any of the cities. In fact there were recommendations that thicknesses of two inches and more be allowed as maintenance so as to permit resurfacing secondary streets with gas tax funds. It was finally agreed that the State policy was flexible enough to permit thicknesses of 1½ inches as maintenance and that the policy would apply to the expenditure of the gas tax allocation to cities. Obviously the same work cannot be both maintenance and construction at the same time and since the department has no veto authority over maintenance work, the cities may proceed with resurfacing 1½ inches thick as maintenance without securing approval of the department. Since resurfacing 1½ inches thick is classed as maintenance any resurfacing to be classed as construction would have to be greater than that thickness, that is two inches or more.

Along these same lines I might mention the demarcation between maintenance and construction for various types of oil treatment. The general principle is that any operation which raises the standard of surfacing to a higher type constitutes construction payable from construction funds while any operation which restores the surface to the condition to which it was originally constructed and does not provide a higher type of surface is classed as maintenance and is payable from maintenance funds. For example, a seal coat placed in conjunction with the construction of a plant mix or other type of bituminous surfacing or pavement would be a construction operation payable from construction funds. While a seal coat placed a year or so later to prevent raveling or prevent penetration of moisture would be classed as maintenance and be payable from maintenance funds. That is, the first application of an oil treatment to an unoiled surface would constitute construction while subsequent retreatment would be classed as maintenance.

We are willing to be broad minded in the application of these principles and, where both types of work are in-

. . . Continued on page 59

* Mr. Campbell retired on April 30th of this year.

Basic Photogrammetry

Continued from page 53 . . .

A photographic model which will produce a map at 1″ = 50′ is capable of producing 2-foot contours at slight additional cost over 5-foot contours. Or, 2-foot contours can be produced at 1″ = 50′ for approximately the same cost as at 1″ = 100′. With this in mind, a good balance between scale and contour interval is as follows:

1″ = 50′	2′ contours
1″ = 100′	2′-5′ contours
1″ = 200′	10′ contours
1″ = 400′	10′-20′ contours

The area of a map (and therefore the area of each photographic model) varies as the *square* of the map scale; that is a map at 1″ = 50′ requires four times the map area as a map at 1″ = 100′ and also requires 4 times as many photographic models. However, for usual highway strip maps of one model width (1000-2000 feet) only twice as many models would be required for 1″ = 50′ as for 1″ = 100′.

Determination of Requirements

In preparing photogrammetry work for contract, a common fallacy is to order a strip in some rounded figure, such as one mile wide which may have little bearing on actual requirements. Another version is to order a strip to full width of film negative, such as nine inches at 800 feet per inch = 7,200 feet width of strip.

Standard aerial film is 9″ x 9″ which multiplied by the flight scale equals the width of strip flown; that is at 1″ = 400′ the maximum width of flight strip is 9 x 400 = 3600 feet. However, the outer inch on each side of the negative is often not too clear or precise, which reduces the width to 7 inches. Furthermore, a full width strip means that the flight line must be flown perfectly with no allowance for deviation, crabbing or tilt. It is therefore common practice to use 70 percent of the film coverage for computing flight lines. This factor applies when one, two or more flight lines are required for a given width; that is at 1″ = 400′ one flight line will produce 70% of 3600′ = 2520′, say 2500; two lines 5000′; three lines 7500′, etc.

One-flight Line

There is no object in specifying a width requiring two or more flight lines when one will suffice.

The preferred method of specifying a one-flight line strip is to simply draw a single line on a map as the center line of the strip and specify that this center line shall fall within the center two inches of the photograph. In this case, no outside limits of flight are required as the specified contact scale roughly establishes the width.

For contour or planimetric maps it is highly important to keep the width of the mapped area to a minimum. If at all possible keep the strip to the width of one model which is also the width of one practical flight line. As outlined above for picture work, the practical width of a flight line at 1″ = 400′ is 70 percent of 3,600′ or 2,500′, however for contour work it is safer to use 60 percent or 2,160′ (say 2,000′ as the practical working width of such a model).

Whenever possible the width of contour or planimetric strips should be reduced to 1,000′ or even less. It is true that ground control, picture points, and model set-up costs are approximately the same for a 1,000′ as for a 2,000′ strip in the above case. The actual cost of the additional 1,000 feet is merely the added plotting cost (not including model set-up) which in this case would add 25 percent to the total cost of the work. However, contractors sometimes add up to 60 percent for such additional width because our projects are not as clean cut as above outlined. Additional 1,000′ widths often require additional models and ground control because of serpentine alignment, improper flight lines, and unforeseen difficulties.

Costs

In planning photogrammetry work, consideration should be given to the following criteria:

1. Separate flights are usually required for mosaics and contour work.
2. Simple mosaics or enlargements will usually suffice for preliminary work which can be supplemented with contour or planimetric maps for detail design work.
3. Generally in loss of detail, a 6-diameter enlargement by projection is comparable to a 3-diameter enlargement by photocopy.
4. Mosaics made from large scale photography require piecing numerous prints together and photocopying. The process is costly and leads to numerous errors.
5. Whenever possible, mosaic photography should be kept to one flight line. It is also desirable to use small scale photography covering the width of strip in one photograph, obtain 4- to 6-diameter enlargements and use as mosaics; or join two or more enlargements together as mosaics.
6. Contour and planimetric maps should be kept to one model width, if possible.
7. Increasing the photo scale has same effect as increasing the mapped area. The square footage of map varies as the square of map scale.
8. On contour maps, keep the map scale compatible with the contour interval. For instance, 2′ contours are in scale at 1″ = 50′ and costs approximately the same as 2′ contours at 1″ = 100′.
9. A mapping project of such magnitude as will provide continuity of operations, will cut down the contractor's overhead and absorb "move in and out costs." For this reason, unit costs for a $5,000 project may be 50 percent higher than for a $50,000 project.

Following are a few approximate cost factors:

Contour Maps

1″ = 50′	2′ contours	$10-$25 per acre
1″ = 100′	5′ contours	$5-$12 per acre
1″ = 400′	10′-20′ contours	$1.50-$3 per acre

Enlargements, Typical Example

At 1″ = 200′ from flight scale of 1″ = 800′
5,000′ wide one flight strip
$80 per mile, including two sets enlargements, contact prints and index map.

Mosaics, Typical Example

At 1″ = 200′ from flight scale of 1″ = 800′
Limit to 4-diameter enlargement and preferably 2½ or 3-diameter
$100 to $350 per mile.

Gas Tax to Cities

Continued from page 58 . . .

volved in the same job, are willing to call the entire job construction. For example, where a street is being widened and it is necessary or desirable to resurface the old pavement so the entire surface will be of uniform appearance even though the resurfacing is only one inch thick, or in the case of resurfacing two inches thick, should more or less patching of the old base be necessary, the entire operation will be classed as construction. That is, it is not necessary to segregate the maintenance operation from the construction operation and finance the two operations from separate funds. We must not, however, let the tail wag the dog by making one block construction and the next block maintenance and then classifying the whole job as construction. In such case each section would have to be classified on its merits.

In Memoriam

ALAN L. ROBBINS

Alan L. Robbins, 30, junior civil engineer with the Division of Highways in District XI, San Diego, was struck and fatally injured on February 25th by a passing car while he was surveying near Indio.

Robbins had been with the division since June, 1950, when he was appointed senior engineering aid with the design department of District XI. He was advanced to junior civil engineer in June of 1951.

Robbins was born in Long Beach on November 13, 1922, and attended Hoover High School in San Diego. During World War II he served with the U. S. armed forces, after which he resumed his studies, graduating from San Diego State College in 1950 with a B.S. degree in engineering.

He is survived by his mother, Mrs. Marie Robbins, and two sisters.

C. E. Bovey

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to Stockton when the district office was transferred there in 1933. He was appointed Assistant District Engineer in 1947.

Bovey was born in Grass Valley and attended grade school in Nevada City and high school in Sacramento.

His first job was with the Southern Pacific Company on surveying and inspection work on the construction of the railroad between Sacramento and Walnut Grove. Later he worked as chief of a survey party on the reconstruction of the levees on the Sacramento and American Rivers near Sacramento, and as chief draftsman at the Southern Pacific division office in Sacramento.

Bovey is married and has two children, Mrs. Joyce G. Keehner of Sacramento, and Robert Bovey of Stockton.

He is a thirty-second degree Mason and has been active in Y. M. C. A. and church work during the many years he has lived in Stockton. He also served as alternate chief of engineering services for District 4 of the Office of Civil Defense, located at Stockton.

Early Days

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To start out the year 1919, Mr. Darlington, chairman of the commission, stated that it was agreeable with him to pass the honor and responsibilities of his position to another member, and he offered his resignation to the other two members. Commissioner Whitmore immediately nominated Mr. Darlington to succeed himself, and the motion was seconded by Commissioner Phillips. The re-election of Commissioner Darlington to the chairmanship was declared in effect.

At the meeting of January 22d, Commissioner Whitmore made a motion, and it was voted that the secretary be instructed to begin the preparation of copy and data for the publication of the next number of the *California Highway Bulletin*, to be issued on or before June 1, 1919.

Also, on this date, the minutes use up five pages for an agreement with the Department of Agriculture on Project 9. This called for building a road between the Tecate Divide and a point easterly on the San Diego-Imperial County boundary line, a distance of 15.2 miles, which was known locally as the San Diego-El Centro Road.

At the meeting of February 26th, a delegation consisting of Mr. Frank B. Durkee and Dr. Copeland, representing the Chico Chamber of Commerce, appeared and urged the commission to begin early construction of that section of the state highway between Nelson and Biggs in Butte County.

Chairman Darlington explained that the commission was not in a position to make any promises on account of the shortage of funds, but stated that it would take the matter under advisement and improve or complete the road as soon as funds were made available. This is the same Frank Durkee who is now Director of Public Works, and as such is ex officio member and Chairman of the California Highway Commission.

(To Be Concluded)

Cajon Pass

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minor slides off the Blue Cut. Intermittently, it was necessary to remove the accumulation behind the wall to provide storage for the continuing fall of debris from the unstable slide material.

Eventually, the slopes stabilized and the rock wall was removed to provide room for the four-lane section being constructed under this contract. The cut itself was not disturbed, but to provide safety from possible rolling material from the high bank of unpredictable gouge material, a wire mesh fence fastened to 10-inch wide flange 25-pound steel columns was constructed at the toe of the slope.

Three Transcontinental Highways

Three transcontinental highways use the historic gateway serving the ever increasing traffic to and from Southern California. U. S. 395 leads from San Diego through the Cajon Pass to the Canadian border by way of Reno, Nevada, and Spokane, Washington. U. S. 91 utilizes the pass in carrying traffic from Long Beach to Las Vegas, Nevada, Salt Lake City, Utah, and Pocatello, Idaho. U. S. 66 also traverses the Cajon on its way to Chicago through Needles and Oklahoma City.

With steep grades and limited sight distance existing on most of the highway through the pass, the improvement is a great boon to the 7,500 vehicles using the road each day. About 10 percent of the traffic consists of trucks, most of which are of the multiple-axle long-haul type.

Plans are complete for the next project to extend from Gish Underpass to 1.4 miles north of Cajon Summit, a length of 5.8 miles. Plans are rapidly being developed to extend the four-lane expressway from the summit to Victorville on the Mojave Desert. Construction dates are as yet indefinite and will depend on available financing.

The assistance of the *San Bernardino Sun* and its Historical Editor, L. Burr Belden, is gratefully acknowledged in the preparation of this article.

HIGHWAY BIDS AND AWARDS

March, 1953—Continued

CONTRA COSTA COUNTY—Between Danville and Concord (portions), and at Avon intersection, a net length of about 3.0 miles; existing roadbeds to be widened and new roadbeds to be constructed, and plantmixed surfacing to be placed over new cement treated base and existing pavement. District IV, Route 107, 75, 106, Section A, Wlc, B, Cnd, C. Lee J. Immel, San Pablo, $291,753.50; James R. Armstrong, El Cerrito, $300,518.36; J. Henry Harris, Berkeley, $313,304.90; Louis Biasotti & Son, Stockton, $332,945.50; Clements & Co., Hayward, $345,583.20. Contract awarded to Gallagher & Burk, Inc., Oakland, $291,482.70.

GLENN COUNTY—At Big Butte Creek overflow about 6 miles east of Butte City, a reinforced concrete slab bridge on concrete pile bents to be constructed, and about 0.3 mile of approaches to be graded and surfaced with untreated rock surfacing and bituminous surface treatment applied. District III, Route 45, Section C. Friant Construction Co., Fresno, $57,915.50; Anson-Smith Construction Co., Marysville, $58,884.48; B. S. McElderry, Berkeley, $59,773; R. E. Hertel, Sacramento, $62,378.50; G. M. Carr Co. & Bati Rocca, Santa Rosa, $64,911.90; Fredrickson Bros., Emeryville, $66,209.50; Al Erickson & Co., Napa, $67,484.50; O'Connor Bros., Red Bluff, $68,230.14; Tricon Construction Corp., San Rafael, $68,345.50; R. G. Clifford & C. O. Bodenhamer, Berkeley, $69,649.10; J. Henry Harris, Berkeley, $72,801.05; Paul E. McCullum, Richmond, $73,857; Wheeler Construction Co., Oakland, $80,520. Contract awarded to A. A. Edmondson, San Fernando, $57,743.50.

LOS ANGELES COUNTY—In the Cities of Los Angeles and South Pasadena at various locations on Hollywood, Santa Ana, Ramona, and Arroyo Seco Freeways, reconstruct storm damaged slopes. District VII, Route 2, 26, 205. Henry C. Soto Corp., Los Angeles, $27,730.75. Contract awarded to Justice-Dunn Co., Oakland, $26,122.25.

LOS ANGELES COUNTY—On Garvey Avenue, between Holt Avenue and Bellevue Avenue about 0.5 mile in length, 48" chain link fence to be constructed. District VII, Route 26. Los Angeles Fencing Co., Inc., Los Angeles, $2,950; Crown Fence & Supply Co., Ltd., Pasadena, $2,950; Cyclone Fence Department, American Steel and Wire Division United States Steel Corp., Glendale, $2,992.50; Pacific Fence Co., Los Angeles, $2,997; Alcorn Fence Co., Los Angeles, $3,050; Frank O. Querry D.B.A. American Chain Link Machine Co., Los Angeles, $3,075; Burketl Fence Co., Los Angeles, $3,150; The California Wire Cloth Corporation, Los Angeles, $3,225; Southern California Fence Co., Compton, $3,890. Contract awarded to Mills Fencing Co., Bell Gardens, $2,875.

MENDOCINO COUNTY—Across Noyo River, about 1 mile south of Fort Bragg, an existing steel bridge to be cleaned and painted. District I, Route 56, Section E. D. Zelinsky & Sons, San Francisco, $78,626; Klaas Bros., Los Angeles, $79,320; R. W. Reade & Co., Berkeley, $84,205; J. S. Morris Co., Berkeley, $91,880. Contract awarded to Acme Maintenance Engineering Co., Montebello, $72,865.

MONTEREY COUNTY—Across Salinas River at San Ardo, an existing bridge to be cleaned and painted. District V, Route 2, Section H. John P. McGuire, San Jose, $19,782; Klaas Brothers, Los Angeles, $22,354; J. S. Morris Co., Berkeley, $22,-752; Allied Painters and Decorators Inc., Oakland, $24,686; Acme Maintenance Engineering Co., Montebello, $25,939; R. W. Reade & Co., Berkeley, $27,630; J. P. Carroll Co., Los Angeles, $32,-736; Eric Lundeen Inc., Los Angeles, $38,350. Contract awarded to D. Zelinsky & Sons, San Francisco, $16,184.

SANTA CLARA COUNTY—At the intersection of Bayshore Highway with Embarcadero Road, traffic signal system and highway lighting to be furnished and installed and channelization to be constructed. District IV, Route 68, Sections A, PA. Joe W. Douglass, San Jose, $35,211.25; J. Henry Harris, Berkeley, $38,348; Edward Keeble, San Jose, $38,579; A. J. Raisch Paving Co., San Jose, $39,-094.80. Contract awarded to L. C. Smith Co., San Mateo, $34,959.25.

SAN DIEGO COUNTY—In the City of Oceanside, between ¼ mile south of Mission Avenue and San Luis Rey River, about 1 mile of roadside areas to be prepared and planted. District XI, Route 2. Justice-Dunn Co., Oakland, $26,234.44; Jannoch Nurseries, Altadena, $28,217.28. Contract awarded to Castro and Fisher, Glendale, $24,378.09.

SAN MATEO COUNTY—Over Bayshore Freeway at Peninsular Avenue, in the City of San Mateo, an existing steel bridge to be cleaned and painted. District IV, Route 68. D. Zalinsky & Sons, San Francisco, $19,681; J. P. Carroll Co., Los Angeles, $19,700; John P. McGuire, San Jose, $19,-928; J. S. Morris Co., Berkeley, $21,440; Acme Maintenance Engineering Co., Montebello, $24,-930; R. W. Reade and Co., Berkeley, $32,513. Contract awarded to Allied Painters & Decorators, Inc., Oakland, $18,842.

SAN MATEO COUNTY—City of San Mateo between Lindbergh Street and 0.1 mile east of South Norfolk Street, full traffic actuated signal system and highway lighting to be furnished and installed and channelization to be constructed. District IV, Route 105. The Lowrie Paving Co., Inc., San Francisco, $29,187.60; J. Henry Harris, Berkeley, $29,903.90; Piombo Construction Co., San Francisco, $29,922. Contract awarded to L. C. Smith Co., San Mateo, $28,513.50.

F. A. S. County Route

SANTA CRUZ COUNTY—On San Andreas Road, between Monterey Bay Academy and Monresa Beach, about 2.3 miles in length to be surfaced with plantmixing surfacing. District IV, Route 1147. Edward Keeble, San Jose, $18,812.50; Leo F. Piazzi Paving Co., San Jose, $20,272.26. Contract awarded to Granite Construction Co., Watsonville, $17,704.75.

April, 1953

BUTTE COUNTY—At junction of Routes 21 and 87 about 0.5 mile south of Oroville, about 0.4 mile in length to be graded and surfaced with plant-mixed surfacing on untreated rock base. District III, Route 21, 87, Section A, A. O'Conner Bros., Red Bluff, $43,137.65; J. Henry Harris, Berkeley, $43,-288.75. Contract awarded to Rice Bros., Inc., Marysville, $39,375.05.

CONTRA COSTA COUNTY—Between Muir Station and Route 75 about 3.6 miles in length, to be surfaced with plant-mixed surface on cement treated base and existing pavement. District IV, Route 106, Section C. J. R. Armstrong, Oakland, $206,042.95; Lee J. Immel, San Pablo, $222,855; Frederickson & Watson Construction Co., Oakland, $226,874.80; J. Henry Harris, Berkeley, $239,-103.70. Contract awarded to Gallagher & Burk, Inc., Oakland, $196,987.30.

FRESNO COUNTY—Between 0.4 mile north of city limits of Kingsburg and south city limits of Selma, about 3.3 miles to be resurfaced with plant-mixed surfacing. District VI, Route 4, Section A. Baun Construction Co., Fresno, $74,417.50; Volpa Bros., Fresno, $77,350; Gene Richards, Inc., Fresno, $79,196; Thomas Construction Co., Fresno, $79,490; Valley Paving Co., Pismo Beach, $81,812.50. Contract awarded to Rex B. Sawyer, Wm. S. & Bruce F. Rogers Co., Madera, $65,560.

FRESNO COUNTY—On Ventura Avenue between Orange Avenue and Maple Avenue, in and adjacent to the City of Fresno, about 1.0 mile in length to be resurfaced with plant-mixed surfacing and drainage sumps to be constructed. District VI, Route 41. Volpa Bros., Fresno, $32,771.80; Baun Construction Co., Fresno, $33,008; Thomas Construction Co., Fresno, $34,474. Contract awarded to Gene Richards, Inc., Fresno, $30,554.50.

FRESNO COUNTY—Across Wahtoke Creek, about 22 miles east of Fresno, a reinforced concrete slab bridge to be repaired. District VI, Route 41, Section S. Friant Construction Co., Fresno, $9,-882.60; Volpa Bros., Fresno, $11,433; Trewhitt, Shields, and Fisher, Fresno, $12,178.30. Contract awarded to Kaweah Construction Co., Visalia, $9,-162.35.

HUMBOLDT COUNTY—In Humboldt County, about 6 miles south of Eureka (I-Hum-1-G), a reinforced concrete cattlepass to be constructed. District I, Route 1, Section G. Reed and Tuttle, Redwood Valley, $11,694; Humboldt Constructors, Inc., Eureka, $12,534; Beverly S. McElderry, Berkeley, $15,902. Contract awarded to Mercer Fraser Co. & Mercer Fraser Gas Co., Inc., Eureka, $11,225.

IMPERIAL COUNTY—At Sand Hills Maintenance Station, a cottage to be constructed, District XI, Route 27, Section B. Cotton Construction Co., Chula Vista, $18,881. Contract awarded to Sooy and Jackson Builders & Contractors, Redlands, $15,-465.

IMPERIAL COUNTY—Between 2 miles northwest of Frink and the Riverside County Line, about 11.3 miles in length to be widened with imported base material and road-mixed surfacing. District XI, Route 187, Section G. R. R. Hensler, Sun Valley, $66,970; James E. Roberts, San Bernardino, $67,-831; E. C. Young, San Fernando, $71,745.70; Norman I. Fadel, North Hollywood, $72,460; Marks Bros. Construction Co., El Centro, $74,962; Dimmitt & Taylor, Monrovia, $75,160; Arthur H. Famularo & Roland T. Reynolds. Anaheim, $83,-485; Basich Bros. Construction Co. (Corporation), R. L. Basich (Individual), H. L. Basich (Individual), South San Gabriel, $83,774; Robert E. L. Parker Co., Claremont, $90,838; Flickinger-Welker, Inc., Los Angeles, $107,825. Contract awarded to Geiser Construction Co., Buena Park, $65,286.80.

INYO COUNTY—Between 1½ and 12½ miles northwest of Bishop, four reinforced concrete bridges to be widened. District IX, Route 23, Sections E, F. Norman I. Fadel, North Hollywood, $20.667; B. S. McElderry, Berkeley, $21,493.50; Bishop Engineering and Construction Co., Bishop, $27,427.60. Contract awarded to Charles H. Major, Ojai, $15,-671.50.

INYO COUNTY—Portions between Rilling Hills and Darwin Junction, about 4.4 miles in net length, to be graded and surfaced with road-mixed surfacing on imported base material. District IX, Route 127, Section D, E. E. C. Young, San Fernando, $113,543; Chas. J. Rounds Co., Los Angeles, $115,284.48; Roland T. Reynolds, Anahiem, $123,694.35; Eaton & Smith, San Francisco, $129,987.90; Flickinger & Walker, Inc., Los Angeles, $133,960.90; James E. Roberts, San Bernardino, $134,487.90; The Roger Co., Santa Barbara, $157,528.49. Contract awarded to Hess Construction Co., Inc., Long Beach, $111,-535.85.

INYO COUNTY—Across Ash Creek and Cottonwood Creek, about 42 and 44 miles north of Kern County Line, two reinforced concrete bridges to be constructed. District IX, Route 23, Section J. Wonderly Construction Co., Long Beach, $31,348; E. S. & N. S. Johnson, Fullerton, $33,313; Norman I. Fadel, North Hollywood, $35,051; Monterey Construction Co., El Monte, $35,540; Joseph E. Bonadiman, El Monte, $36,560.50; Chas. J. Rounds Co., Los Angeles, $37,707; Oilfields Trucking Co., Bakersfield, $39,035. Contract awarded to Friant Construction Co., Fresno, $25,973.50.

LAKE COUNTY—Across Putah Creek about 4 miles northeast of Middletown, a reinforced concrete bridge approaches and a detour to be constructed. District I, Route 49, Section 4, Oliver de Silva & Minton Co., Oakland, $169,414.50; S & Q Construction Co., San Francisco, $173,583.10; R. G. Clifford & C. O. Badenhamer, Berkeley, $177,666; Chaney Construction Co., Los Angeles, $190,846.-50; G. M. Carr Co. & Bati Rocca. Santa Rosa, $192.-009.50; Bishop, Younger, Bradley Co., San Francisco, $194,942.50; Barton Construction Co., & Underground Construction Co., Oakland, $199,-

564.50; Charles MacClosky Co., San Francisco, $204,864.50; Bos Construction Co., Berkeley, $214,-701.50; Baldwin Contracting Co., Inc., San Rafael, $219,276.25; Anson-Smith Construction Co., Marysville, $227,579; O'Connor Bros., Red Bluff, $230,-994.50; Paul E. McCollum, Richmond, $235,998. Contract awarded to Victor Weidmer, Penryn, $159,-778.50.

LOS ANGELES COUNTY—City of Whittier at the intersection of Whittier Boulevard with Laurel Avenue, traffic signal system to be furnished and installed. District VII, Route 2. Westates Electrical Construction Co., Los Angeles, $4,787; Fischbach and Moore, Inc., Los Angeles, $5,065. Contract awarded to Electric and Machinery Service Inc., South Gate, $4,567.

LOS ANGELES COUNTY—On Foothill Blvd. between Alta Canyada Rd. and La Canada-Verdugo Rd., about 2.0 miles in length, to be paved with plant-mixed surfacing on cement treated base and existing pavement. District VII, Route 9, Sections A, B. J. E. Haddock, Ltd., Pasadena, $134,890.50; Schroeder & Company, Sun Valley, $135,677.70; Jesse S. Smith, Glendale, $141,802.50; Griffith Company, Los Angeles, $144,297.50; J. A. Thompson & Son, Contractors, Inglewood, $174,657.50. Contract awarded to Osborn Company, Pasadena, $132,688.25.

LOS ANGELES COUNTY—At the intersections of Fifth Avenue with Hansen Avenue and with Buena Vista Avenue in the city of Pomona, traffic signal systems and highway lighting to be furnished and installed. District VII, Route 19. Westates Electrical Construction Co., Los Angeles, $10,619; Electric and Machinery Service, Inc., South Gate, $10,884; C. D. Draucker, Inc., Los Angeles, $11,-233. Contract awarded to Ed Seymour, Long Beach, $10,492.

LOS ANGELES COUNTY—On Santa Ana Freeway between Pioneer Boulevard and Rosecrans Avenue, highway lighting and illuminated sign system to be furnished and installed and traffic signal and highway lighting equipment to be removed and salvaged. District VII, Route 166, Section A. C. D. Draucker, Inc., Los Angeles, $113,791; Ets-Hokin and Galvan, Wilmington, $115,813; Westates Electrical Construction Co., Los Angeles, $116,565; Electric and Machinery Service, Inc., South Gate, $118,845. Contract awarded to A. S. Schulman Electric Co., Los Angeles, $112,490.

LOS ANGELES COUNTY—In and adjacent to the cities of Redondo Beach and Manhattan Beach, on Redondo Beach Blvd. between Pier Ave. and Inglewood Ave., traffic signal systems and highway lighting to be furnished and installed. District VII, Route 175, Sections Rdo, B, Man., B, A. Westates Electrical Construction Co., Los Angeles, $38,087; Electric and Machinery Service, Inc., South Gate, $38,278. Contract awarded to C. D. Draucker; Inc., Los Angeles, $37,592.

MADERA COUNTY—At Cottonwood Creek, about 3.4 miles south of Madera, a reinforced concrete slab bridge to be constructed and about 0.5 mile of approaches to be graded and surfaced with plant-mixed surfacing on cement treated base. District VI, Route 126, Section A. Gene Richards, Fresno, $77,618.50; Volpa Brothers, Fresno, $83,-454.50; Baun Construction Co., Fresno, $84,019; Trewhitt-Shields & Fisher, Fresno, $87,211.10; J. Henry Harris, Berkeley, $93,516.55; W. F. Maxwell, Los Angeles, $97,921; Tumblin Co., Bakersfield, $104,139. Contract awarded to Thomas Construction Co., Fresno, $65,642.

MADERA COUNTY—Between Route 32 and south city limits of Chowchilla, about 2.5 miles in length, to be resurfaced with plant-mixed surfacing. District VI, Route 124, Section A. Volpa Brothers, Fresno, $39,868.50; Baun Construction Co., Fresno, $42,425; Thomas Construction Co., Fresno, $44,-448.75; Gene Richards, Fresno, $52,011.25; J. Henry Harris, Berkeley, $56,069.50; Browne & Krull, Hayward, $56,700. Contract awarded to Fredrickson & Watson Construction Co., Oakland, $37,931.50.

MENDOCINO COUNTY—Across the north fork of the Navarro River, about 17 miles northwest of Booneville, a reinforced concrete bridge to be constructed and approaches to be graded and surfaced. District I, Route 48, Section C. G. M. Carr Co., and Bati Rocca, Santa Rosa, $145,888.50; Chaney Construction Co., Los Angeles, $147,-405.50; Tricon Construction Corp., San Rafael, $148,916.25; Barton & Scheyer, El Cerrito, $157,-469; R. E. Hertel, Sacramento, $168,852.50; Bishop, Younger, Bradley Co., San Francisco, $171,268; R. G. Clifford & C. O. Bodenhamer, Berkeley, $171,-818. Contract awarded to Transocean Engineering Corp., Hayward, $145,547.50.

MENDOCINO COUNTY—At Ten Mile River, about 7.8 miles south of Fort Bragg, a bridge to be constructed and approaches, about 1.4 miles in length, to be graded and surfaced with road-mixed surfacing on cement treated base. District I, Route 56, Section F. Charles MacCloskey Co., San Francisco, $749,738.40; Erickson, Phillips & Weisberg, Concord, $752,058; Fredrickson Bros., Le-Boeuf-Dougherty Construction Co., & Erickson & Pierson, Emeryville, $759,998.30; J. H. Pomeroy & Co., Inc., San Francisco, $791,999; Tumblin Co., Bakersfield, $847,296; Trewhitt, Shields & Fischer, Fresno, $814,498. Contract awarded to Bishop, Younger, Bradley Co., San Francisco, $715,573.10.

MERCED COUNTY—Between north end of Livingston Underpass and south of Delhi, about 3.4 miles in length to be graded and surfaced with portland cement concrete on cement treated subgrade and with plant-mixed surfacing on untreated rock base to provide a four lane divided highway. District X, Route 4, Section D. Fredrickson Bros., Emeryville, $398,562.10; Fredrickson & Watson Construction Co., Oakland, $407,503.90; M. J. B. Construction Co., Stockton, $414,587.15; Guy F. Atkinson Co., South San Francisco, $417,299; Chas. L. Harney, San Francisco, $476,659.50; Ball & Simpson, Berkeley, $486,664.30. Contract awarded to Ukropine-Polich-Kral, San Gabriel, $396,436.10.

MONO COUNTY—Between 2.4 miles south of Mammoth Road and 1.7 miles south of Mammoth Road, about 38 miles north of Bishop, about 0.6 mile in length to be graded and surfaced with road-mixed surfacing. District IX, Route 23, Section D. The Roger Co., Santa Barbara, $27,879.20; Eaton & Smith, San Francisco, $35,750.70; Friant Construction Co., Fresno, $36,695; Bishop Engineering & Construction Co., Bishop, $363,996. Contract awarded to Chas. J. Rounds Co., Los Angeles, $21,-846.50.

MONO COUNTY—Between Inyo County Line and Conway Summit, producing and stockpiling screenings. District IX, Routes 23, 112. Oilfields Trucking Co., Bakersfield, $50,691.50; Clements Construction Co., Hayward, $65,860; Floyd O. Bailey, Madera, $84,035; John M. Ferry, Glendale, $91,416.80. Contract awarded to Baker-Mitchell-Thwing Co., San Bernardino, $44,309.70.

MONTEREY COUNTY—Between San Lucas and 2.5 miles north, about 2.4 miles in length, to be graded and surfaced with plant-mixed surfacing on cement treated base. District V, Route 2, Section F. Valley Paving Co., Pismo Beach, $158,326; Hermreck & Easter, Santa Maria, $161,901; Munn and Perkins, Modesto, $191,715. Contract awarded to Granite Construction Co., Watsonville, $153,287.

MONTEREY COUNTY—Between John Street and Market Street in Salinas, two reinforced concrete bridges and approaches about 0.6 mile in net length, to be constructed. District V, Route 2, Section K, Sal. W. A. Thompson & Son and N. F. Maxwell, Inglewood, $535,198.95; Charles MacClosky Co., San Francisco, $538,944.35; Gordon H. Ball & San Ramon Valley Land Co., Berkeley, $554,-310.13; Trewhitt-Shields & Fisher, Fresno, $558,-739.42; Frederickson & Kasler, Sacramento, $565,-481.80; Granite Construction Co., Watsonville, $567,964.25; M. J. B. Construction Co., Stockton, $573,222.40; Carl N. Swenson Co., Inc., San Jose, $587,263.58; Transocean Engineering Corp., Hayward, $598,972.10; Bishop, Younger, Bradley Co., San Francisco, $611,894.15; Stolte Inc., Monterey, $626,318.07. Contract awarded to Dan Caputo & Edward Keeble, San Jose, $514,392.55.

MONTEREY COUNTY—Between 10 miles and 55 miles south of Monterey, 4 cattle passes to be replaced with corrugated metal pipes, culverts and bridge across Buck Creek to be redecked. District V, Route 56, Section C, D, F, H. Chaney Construction Co., Los Angeles, $39,897; Minton Co., Oakland, $43,922.20; R. G. Clifford & C. O. Bodenhamer, Berkeley, $45,720; E. G. Perham, Los Angeles, $48,024; Friant Construction Co., Frersno, $48,720; William Radtke & Son, Gilroy, $52,208; S. & Q. Construction Co., San Francisco, $59,180; James B. Allen, San Carlos, $63,993; Stolte Inc., Monterey, $66,315. Contract awarded to H. H. Anderson, Hayward, $35,634.

MONTEREY COUNTY—Across Little Sur River, about 20 miles south of Monterey, a reinforced concrete bridge and road approaches to be constructed, District V, Route 56, Sections F, G. Granite Construction Co., Watsonville, $191,854; Thomas Construction Co., Fresno, $193,934; Transocean Engineering Corp., Hayward, $202,412.75; R. G. Clifford & C. O. Bodenhamer, Berkeley, $202,-494.50; Chaney Construction Co., Los Angeles, $202,913; The Lowrie Paving Co., San Francisco, $207,795.50; G. M. Carr Co. & Bati Rocca, Santa Rosa, $210,853.20; Dan Caputo, San Jose, $212,-462; Gordon H. Ball-San Ramon Valley Land Co., Berkeley, $213,176; Trewhitt-Shields & Fisher, Fresno, $215,022.80; Tumblin Co., Bakersfield, $226,140; E. G. Perham, Los Angeles, $226,545.50; Stolte Inc., Monterey, $229,467.65; Wm. Radtke & Son, Gilroy, $273,829.10; Chas. McClosky Co., San Francisco, $311,803. Contract awarded to Condick Co., Berkeley, $165,662.25.

NAPA COUNTY—Between Oakville and Rutherford, a distance of about 1.8 miles to be widened with plant-mixed surfacing on untreated rock base and existing portland cement concrete pavement to be resurfaced with plant-mixed surfacing. District IV, Route 49, Section B. O. C. Jones & Sons, Berkeley, $136,058.30; Munn & Perkins, Modesto, $140,-802; Brown-Ely Co. Contractors, Corte Madera, $156,906.90; E. A. Forde, San Anselmo, $161,169; A. G. Raisch Co., San Rafael, $174,581.65. Contract awarded to Arthur B. Siri Inc., Santa Rosa, $136,589.50.

NEVADA COUNTY—Across Truckee River and over the Southern Pacific tracks at Hinton, about 9 miles east of Truckee, railing to be constructed on two bridges. District III, Route 38, Section B. Norman I. Fadel, North Hollywood, $22,140; Friant Construction Co., Fresno, $23,601.20; Bos Construction Co., Berkeley, $29,569.40; H. H. Anderson, Hayward, $30,478; B. S. McElderry, Berkeley, $33,391. Contract awarded to Minton Co. Contractors, Oakland, $18,858.

ORANGE COUNTY—On Newport Blvd. between Route 60 in Newport Beach and 20th Street in Costa Mesa, traffic signal systems and highway lighting at five intersections and highway lighting at four intersections to be furnished and installed. District VII, Route 43, Sections Npt, B, A. Electric & Machinery Service, Inc., South Gate, $51,662; Fischbach & Moore Inc., Los Angeles, $52,868; C. D. Draucker Inc., Los Angeles, $54,483. Contract awarded to Westates Electrical Construction Co., Los Angeles, $50,168.

ORANGE COUNTY—At Coyote Creek, about one mile north of Buena Park, the existing concrete slab bridge to be widened and about 0.08 mile of approaches to be resurfaced with plant-mixed surfacing and widened with plant-mixed surfacing on untreated rock base. District VII, Route 171, Section B. Oberg and Cook, Gardena, $49,394; Norman I. Fadel, North Hollywood, $49,520; Byerts & Sons and George K. Thatcher, J. V., Los Angeles, $54,-257; Charles MacClosky Co., San Francisco, $54,-610; Monterey Construction Co., El Monte, $55,-543.40; W. F. Maxwell, Los Angeles, $56,468.80; A. H. Famularo, Santa Ana, $57,793.50; E. S. & N. S. Johnson, Fullerton, $59,085; Chaney Construction Co., Los Angeles, $59,253; Gerstenberger & Pierson, Los Angeles, $59,551; E. G. Perham, Los Angeles, $59,798; A. A. Edmondson, San Fernando, $59,905; N. M. Saliba Co., Los Angeles, $62,446; Lars Oberg, Los Angeles, $63,080; Concrete Construction Service Inc., Gardena, $64,682.95. Contract awarded to Owl Truck & Construction Co., Compton, $46,222.

RIVERSIDE COUNTY—Between Nuevo Road and March Air Force Base, about 4.8 miles in length, additional roadbed to be graded and surfaced with plant-mixed surfacing on cement treated base and existing pavement to be resurfaced with plant-mixed surfacing to provide a four lane divided highway. District VIII, Route 78, Section D. E. L. Yeager Co., Riverside, $386,640.50; R. A. Erwin, Colton, $400,-701.50; Dimmitt & Taylor, Monrovia, $419,081.65; Cox Bros. Construction Co., Stanton, $450,536.50. Contract awarded to Robert E. L. Parker Co., Claremont, $385,146.50.

RIVERSIDE COUNTY—In Riverside County at Colt Creek, about 34 miles east of Hemet. District VIII, Route 64, Section H. Installing 96" field as-

sembled plate culvert and removing existing timber bridge. E. L. Yeager Co., Riverside, $9,760; E. G. Perham, Los Angeles, $9,883; Norman I. Fadel, North Hollywood, $10,240; Weardco Construction Corp., San Bernardino, $12,285; Geo. Herz & Co., San Bernardino, $13,964. Contract awarded to D. E. Higday, Temple City, $9,385.50.

RIVERSIDE COUNTY—At two locations between 0.3 mile east of Cathedral City and 1.0 mile west of Route 64, about 1.3 miles in net length, to be graded and surfaced with road-mixed surfacing. District VIII, Route 187, Section C. James E. Roberts, San Bernardino, $104,505.50; E. L. Yeager Co., Riverside, $109,723; Hubbs Equipment Co., Colton, $112,018; Basich Bros. Construction Co. (Corporation), R. L. Basich (Individual), N. L. Basich (Individual), $113,169.65; Dimmit & Taylor, Monrovia, $124,195.50; Lester S. Hawley, Montebello, $135,696; George Herz & Co., San Bernardino, $157,150.40; E. C. Young, San Fernando, $163,622. Contract awarded to Matich Brothers & Matich Brothers Paving Co., Colton, $101,472.

SANTA BARBARA COUNTY—Between Winchester Creek and Las Varas Creek, about 3.9 miles in length, to be surfaced with plant-mixed surface and seal coat to be applied. District V, Route 2, Section G. Valley Paving Co., Pismo Beach, $168,-370.70; Munn and Perkins, Modesto, $181,925; Clyde W. Wood and Son, North Hollywood, $184,-164.20; Hermreck and Easter, Santa Maria, $191,-880; Granite Construction Co., Watsonville, $196,670. Contract awarded to Baker and Pollock, Ventura, $168,202.

SANTA BARBARA COUNTY—Between 1 mile east of Carpinteria and 0.5 mile east of Arroyo Parida and between Ortega Hill and Sheffield Drive, about 3.6 miles in length, roadways, ramps and frontage roads to be graded, seven reinforced concrete bridges to be constructed and ramps, and frontage roads to be surfaced with plant-mixed surface on untreated rock base. District V, Route 2, Sections H, J. Granite Construction Co., Watsonville, $1,109,095; Clyde W. Wood & Sons, Inc., and Charles MacClosky Co., North Hollywood, $1,111,-159.35; J. A. Thompson & Son and W. F. Maxwell, Inglewood, $1,114,645.90; Gordon H. Ball & San Ramon Valley Land Co., Berkeley, $1,129,415.67. Contract awarded to Fredrickson & Watson Construction Co., Oakland, $1,085,489.

SAN BERNARDINO COUNTY—Between Los Angeles County Line and Archibald Avenue about 7.2 miles in length, to be graded and paved with portland cement concrete pavement on cement treated subgrade to provide a four-lane divided highway. District VIII, Route 26, Sections C, Upl, Ont, D. Fredrickson & Watson Construction Co., Oakland, $2,402,682.40; Guy F. Atkinson Co., Long Beach, $2,441,734; Webb & White, Los Angeles, $2,497,999.50; Griffith Co., Los Angeles, $2,563,-455.20; B. J. Ukropina, T. P. Polich, Steve Kral, John R. Ukropina, San Gabriel, $2,585,961; J. E. Haddock, Ltd., Pasadena, $2,588,897.55; Gordon H. Ball and San Ramon Valley Land Co., and Ball & Simpson, Berkeley, $2,634,386.60; R. R. Hensler, Sun Valley, $2,960,779. Contract awarded to J. A. Payton, George Herz & Co., and Clyde W. Wood & Sons, Inc., Riverside, $2,308,178.22.

SAN BERNARDINO COUNTY—Between 3 miles west of Halloran Springs and Nevada State Line, about 38.8 miles in length, to be widened with plant-mixed surface, a portion to be resurfaced and seal coat to be applied. District VIII, Route 31, Sections L, M, N, P. Basich Bros. Construction Co. (Corporation), R. L. Basich (Individual), N. L. Basich (Individual), South San Gabriel, $313,135. Contract awarded to G. W. Ellis Construction Co., North Hollywood, $309,-917.50.

SAN BERNARDINO COUNTY—Between Los Angeles County line, approximately 3.3 miles southeast of Palmdale, and Route 61, about 6.7 miles in net length, to be graded, base material to be placed and bituminous surface treatment to be applied. District VIII, Route 59, Section A. Clyde W. Wood & Sons, North Hollywood, $78,121; Robert E. L. Parker Co., Claremont, $78,442; Osborn Company, Pasadena, $82,825.50; Jesse S. Smith, Glendale, $89,516; R. A. Erwin, Colton, $91,653; E. C. Young, San Fernando, $93,204.40; Matich Bros., Colton, $95,245; Norman I. Fadel, North Hollywood, $95,-614; Dimmit & Taylor, Monrovia, $104,182.40; Flickinger-Welker, Inc., Los Angeles, $135,431.70. Contract awarded to George Herz & Co., San Bernardino, $68,002.30.

SAN BERNARDINO COUNTY—Between Route 59 and Daly Canyon Road, installing guard railing and guide posts. District VIII, Route 43, Section B. F. H. Harris, San Bernardino, $8,653.80; Rodney B. Braswell, La Canada, $9,122; E. L. Yeager Co., Riverside, $9,470.20; Norman I. Fadel, North Hollywood, $10,208. Contract awarded to George Herz & Co., San Bernardino, $7,911.65.

SANTA CRUZ COUNTY—Between 1.5 miles north of Watsonville and Rob Roy Junction, about 5.7 miles in length to be surfaced with plant-mixed surfacing over existing pavement and existing shoulders to be reconstructed. District IV, Route 56, Section D. Edward Keeble, San Jose, $142,365; Leo F. Piazza Paving Co., San Jose, $143,209.80; Granite Construction Co., Watsonville, $143,742.85; Munn & Perkins, Modesto, $145,787. Contract awarded to Baun Construction Co., Fresno, $139,503.30.

SAN LUIS OBISPO COUNTY—In the city of Arroyo Grande about 1.4 miles in length, to be graded and surfaced with plant-mixed surfacing on cement treated base. District V, Route 2, Section Ar. Gd. Hermreck & Easter, Santa Maria, $99,-691.65; Oilfields Trucking Co., Bakersfield, $110,-556.40; Baun Construction Co., Fresno, $117,469; Madonna Construction Co., San Luis Obispo, $125,-348.50. Contract awarded to Valley Paving Co., Pismo Beach, $96,945.40.

SANTA BARBARA COUNTY—At Gaviota Gorge Tunnel, furnishing and installing highway tunnel lighting system. District V, Route 2, Section E. John A. Rodriquez, Carpinteria, $6,994.71; Santa Barbara Electric Co., Santa Barbara, $7,785. Contract awarded to Ed. H. Anderson Electrical Co., Santa Maria, $6,467.

SHASTA COUNTY—Between Boulder Creek and Project City, about 4 miles in length a 4 lane divided highway to be graded and a bridge across Churn Creek to be constructed. District II, Route 3, Section B. Fredrickson Bros., Emeryville, $568,-437.05; A. Teichert & Son, Inc., Sacramento, $637,466.25; Harms Bros., Sacramento, $643,-379.05; M. W. Brown & R. E. Hertel, Redding, $645,222.86; M. J. B. Construction Co., Stockton, $667,599.90; Eaton & Smith, San Francisco, $668,-542.05; Transocean Engineering Corp., Hayward, $668,566.70; Charles MacClosky Co., & L. A. & R. S. Crow, San Francisco, $678,911.45; Claude C. Wood Co., Lodi, $845,128.93. Contract awarded to Fredrickson & Watson Construction Co., Oakland, $555,555.55.

SHASTA COUNTY—At Shingle Creek about 25 miles east of Redding about 0.2 mile in length, to be graded and surfaced with plant-mixed surfacing and a quintuplicate 48" corrugated metal pipe culvert to be installed. District II, Route 20, Section D. Morgan Construction Co., Redding, $16,925; O'Connor Bros., Red Bluff, $17,745; B. S. McElderry, Berkeley, $18,475; Fredrickson & Watson Construction, Oakland, $19,393; Reed & Tuttle, Redwood Valley, $19,739. Contract awarded to M. W. Brown, Redding, $15,932.

SISKIYOU COUNTY—Between one mile west and one mile east of Forest Mountain Summit, about 1.6 miles in length, to be graded and surfaced with road-mixed surfacing and cement treated base. District II, Route 82, Section D. Fredrickson & Watson Construction Co., Oakland, $355,381; Fredrickson Bros., Emeryville, $365,602; Harms Bros., Sacramento, $377,342.15; Paul E. McCollum, Richmond, $378,167.10; Huntington Bros., Napa, $388,-704; M. W. Brown, Redding, $392,324.09; Natt McDougall Co., Portland, Oregon, $436,833.30. Contract awarded to Eaton & Smith, San Francisco, $335,605.60.

SOLANO COUNTY—Across Napa River near the west city limits of Vallejo, portions of an existing bridge to be redecked. District X, Route 208, Section A. O. C. Jones & Sons, Berkeley, $41,272; Minton Co., Contractor, Oakland, $41,778; R. G. Clifford & C. O. Bodenhamer, Berkeley, $42,813.50; Payne Construction Co., Oakland, $44,132.72; Kevry Construction, Inc., San Leandro, $45,702; Bos Construction Co., Berkeley, $47,318; Healy Tibbitts Construction Co., San Francisco, $48,785; Wheeler Construction Co., Oakland, $52,799; Stanley H. Koller Construction, Crockett, $59,800.50. Contract awarded to Al Erickson & Co., Napa, $40,265.

SONOMA COUNTY—Between 1.1 miles west of Gossage Creek and Gossage Creek, about 1.1 miles in length, to be graded and surfaced with plant mixed surfacing on imported base material. District IV, Route 104, Section C. O. C. Jones & Sons, Berkeley, $140,626.30; Fredrickson Bros., Emeryville, $144,242.65; J. Henry Harris, Berkeley, $147,-950.25; Brown-Ely Co., Contractor, Corte Madera, $149,892.15; Huntington Bros., Napa, $170,714.50; Ace Excavators, Oakland, $221,643.75. Contract awarded to Arthur B. Siri, Inc., Santa Rosa, $128,-169.15.

SONOMA COUNTY—Across Petaluma Creek in the City of Petaluma, a steel bascule bridge to be redecked. District IV, Route 104. S & Q Construction Co., San Francisco, $20,669; Condick Co., Berkeley, $22,735; E. A. Forde Co., San Anselmo, $22,846; R. G. Clifford & C. O. Bodenhamer, Berkeley, $24,080; B. S. McElderry, Berkeley, $24,-180; Bos Construction Co., Berkeley, $24,363; Al Erickson, Napa, $24,495; Barton Construction Co., Oakland, $25,522.60, Minton Co., Contractor, Oakland, $28,664. Contract awarded to Payne Construction Co., Oakland, $18,443.

SONOMA COUNTY—Sonoma State Home at Eldridge, roads and parking areas are to be graded and surfaced with plant mixed surfacing over untreated rock base or salvaged surfacing. District IV. Helwig Construction Co., Sebastopol, $27,908; O. C. Jones & Sons, Berkeley, $29,206; Arthur B. Siri, Inc., Santa Rosa, $29,828.50; J. Henry Harris, Berkeley, $30,523.25; Browne & Krull, Hayward, $34,785.75. Contract awarded to I. J. Ely Co., Larkspur, $24,929.90.

SONOMA COUNTY—Between 0.4 mile north of Petaluma Creek and Petaluma Creek about 0.3 mile of State highway to be graded and imported borrow placed. District IV, Route 1, Section F. Guy F. Atkinson Co., South San Francisco, $391,320; Fredrickson & Watson Construction Co., & M & K Corp., Oakland, $399,970; Ukropina-Polich-Karl, San Gabriel, $455,200; M. Malfitano & Son, Inc. and Vega Engineering and Grading Co., Pittsburg, $473,-660; Harms Bros., Sacramento, $475,050; Piombo Construction Co., San Francisco, $479,430; Fredrickson Bros, Emeryville, $492,090; Chas. J. Rounds Co., Los Angeles, $496,090; McCammon-Wunderlich Co., Palo Alto, $559,900; H. Earl Parker, Inc., Marysville, $590,480; Claude C. Wood Co., Lodi, $699,250. Contracted awarded to Ball and Simpson, Berkeley, $361,820.

SONOMA COUNTY—Between 0.6 mile south of Venezia and 0.2 mile south of Lytton Overhead and between Stony Point Road and 0.1 mile west of Northwestern Pacific Railroad about 2.6 miles in net length to be widened and resurfaced with plant mixed surfacing and a reinforced concrete bridge over the Northwestern Pacific Railroad to be repaired. District IV, Routes I, 51, Sections A, C. A. G. Raisch Co., San Rafael, $123,162.25. Contract awarded to Arthur B. Siri, Inc., Santa Rosa, $123,002.80.

TEHAMA, PLUMAS, LASSEN COUNTY—Between Mineral and about 5 miles east of Westwood, screenings to be furnished and stockpiled. District II, Routes 83, 29. H. Earl Parker, Inc., Marysville, $34,897.50; Allen & Reddy, Red Bluff, $35,100; Howard B. Folsom, Westwood, $38,812.50; Harms Bros, Sacramento, $44,550. Contract awarded to Clements Construction Co., Hayward, $33,750.

VENTURA COUNTY—Between Callegnas Road and 0.4 mile west of Central Avenue, about 5.7 miles to be graded and surfaced with plant mixed surfacing on cement treated base and three reinforced concrete bridges to be constructed, to provide a four-lane divided highway. District VII, Route 2, Sections B, C. Webb & White, Los Angeles, $1,248,-187; Basich Bros. Construction Co., R. L. Basich, N. L. Basich, O. B. Pierson & Bert C. Altfilisch, South San Gabriel, $1,251,759.65; Frederickson & Kasler, Sacramento, $1,259,707.97; Gordon H. Ball and San Ramon Valley Land Co., Berkeley, $1,262,-398.80; J. A. Thompson & Son and W. F. Maxwell, Inglewood, $1,266,241.39; Clyde W. Wood & Sons, Inc., and Charles MacClosky Co., North Hollywood, $1,269,815; Ukropina-Polich-Kral, San Gabriel, $1,293,232.50; Guy F. Atkinson Co., Long Beach, $1,328,500; J. E. Haddock, Ltd., Pasadena, $1,331,-850.70; R. R. Hensler, Sun Valley, $1,416,514.64. Contract awarded to Griffith Co., Los Angeles, $1,170,026.25.

VENTURA COUNTY—On Telegraph Road, between Route 2 and Route 154, a net distance of about 3.4 miles to be surfaced with plant mixed surfacing. District VII, Route 79, Section Ven, A. Griffith Co., Los Angeles, $46,561; Valley Paving Co., Pismo Beach, $51,470; Jesse S. Smith, Glendale, $52,782; Schroeder & Co., Sun Valley, $53,875. Contract awarded to Baker and Pollock, Ventura, $45,873.

YOLO COUNTY—Across Knights Landing Ridge Cut, about ½ mile southwest of Knights Landing, the existing reinforced concrete girder bridge to be widened by replacing the existing concrete railing with new metal curb and railing. District III, Route 87, Section A. Bos Construction Co., Berkeley, $30,799.75; R. E. Hertel, Sacramento, $31,245.75; Friant Construction Co., Fresno, $33,089.50; W. C. Railing, Woodland, $33,282.10; B. S. McElderry, Berkeley, $38,847.50; Wheeler Construction Co., Oakland, $42,055.31. Contract awarded to James W. Hill, Walnut Creek, $24,669.

YOLO COUNTY—Between Yolo Causeway and Tower bridge about 4.0 miles in length to be graded and paved with Portland cement concrete and a reinforced concrete bridge to be constructed. District III, Route 6, Sections B, C. A. Teichert & Sons, Inc., Sacramento, $1,227,940.50; Harms Bros, Sacramento, $1,256,948; Brighton Sand & Gravel Co. and Parish Bros., Sacramento, $1,334,770.47; Fredrickson & Watson Construction Co. and M and K Corp., Oakland, $1,341,547.25; Guy F. Atkinson Co., South San Francisco, $1,353,303.70; Peter Kiewit Sons' Co., San Francisco, $1,386,988; Fredrickson Bros., Emeryville, $1,394,612.90. Contract awarded to Ukropina-Polich-Kral & John R. Ukropina, San Gabriel, $1,215,180.70.

F. A. S. County Routes

RIVERSIDE COUNTY—Between Bloomington Blvd. and Crestmore Bridge about 1.1 miles in length to be graded and surfaced with plant mixed surfacing on cement treated base. District VIII, Route 1177. J. A. Thompson & Son, Contractors, Inglewood, $102,512.30; R. A. Erwin, Colton, $108,381; L. A. & R. S. Crow, El Monte, $109,981.95; Matich Brothers and Matich Brothers Paving Co., Colton, $116,421.50; James E. Roberts, San Bernardino, $131,568.20. Contract awarded to E. L. Yeoger Co. and J. A. Payton, Riverside, $98,932.76.

SAN JOAQUIN COUNTY—On Pacific Avenue between 500 feet north of Hammer Lane and Calaveras River Bridge about 3.1 miles in length to be graded and surfaced with plant mixed surfacing on untreated rock base. District X, Route 543, 641. S. M. McGaw Co., Inc., Stockton, $276,670.50; Clements & Co., Hayward, $283,079.60; Antioch Paving Co., Antioch, $286,587.70; Nomellini Construction Co., Stockton, $289,874.90; Stephens Trucking Co., French Camp, $297,911; Fredrickson Bros., Emeryville, $299,024.60; J. Henry Harris, Berkeley, $300,212.50; M.J.B. Construction Co., Stockton, $328,640.80. Contract awarded to A. Teichert & Son, Inc., Sacramento, $261,441.80.

SAN MATEO COUNTY—Whiskey Hill Road and Portola Road near Woodside about 2.4 miles in length to be graded and surfaced with plant mixed surfacing on untreated rock base. District IV, Route 1048. Douglass & Woodhouse, Redwood City, $189,224; Peter Sorensen, Redwood City, $196,921; Granite Construction Co., Watsonville, $199,887.80; Piombo Construction Co., San Francisco, $207,126.60; McCammon-Wunderlich Co., Palo Alto, $207,911.80; Cecil L. Moore, San Leandro, $215,781.50; S. A. E. Co., Redwood City, $225,261.50. Contract awarded to L. C. Smith Co., San Mateo, $179,756.35.

STANISLAUS COUNTY—On Scenic Drive-Old Oakdale Road, between east city limits of Modesto and State Highway Route 13, about 6.8 miles in length to be surfaced with plant mixed surfacing on untreated rock base and existing surfacing. District X, Route 1191. M. J. Ruddy & Son, Modesto, $131,881.10; Standard Materials Inc., Modesto, $136,938; Ukropina-Polich-Kral, San Gabriel, $149,069; J. Henry Harris, Berkeley, $164,667. Contract awarded to Munn & Perkins, Modesto, $128,680.

SECOND ANNUAL BONNEROO STAG



CONTRACTORS and engineers of District VII assembled on Friday evening, April 17th, to celebrate the occasion of awarding trophies to the contractor and the resident engineer who completed the best district highway contract during the year 1952, as reported in the March-April issue of this magazine.

Earle Withycombe, Assistant State Highway Engineer, and Don G. Evans, Construction Engineer, presented the awards to Adolph Bauer, Superintendent of A. Teichert & Son, Inc., and Alden Carr, Resident Engineer, on Contract 51-7VC37-F, on the Santa Ana Canyon Road between Peralta School and Riverside County Line, the number one contract in District VII. The photograph shows the above-mentioned donors and recipients of awards: Left to right: Carr, Withycombe, Evans, and Bauer.

May, 1953

BUTTE COUNTY—Between junction Route 87 and Chico Avenue, about 9.0 miles to be surfaced with plant-mixed surfacing on untreated rock base. District III, Route 3, Section C. Clements Construction Co. & Clements & Co., Hayward, $394,065; Peter Kiewit Sons' Co., San Francisco, $406,421; A. G. Raisch Co., San Rafael, $408,330; Fredrickson & Watson Construction Co., Oakland, $418,415.20; Granite Construction Co., Watsonville, $429,155; Fredrickson Bros., Emeryville, $436,271; McGillivray Construction Co., Sacramento, $448,220.70; Harms Bros., Sacramento, $473,705. Contract awarded to Rice Bros., Inc., Marysville, $384,424.50.

BUTTE AND GLENN COUNTIES—Across Sacramento River at Gianelli, about 8.5 miles west of Chico, a bridge to be redecked. District III, Route 47, Sections A,A. Judson Pacific-Murphy Corp., Emeryville, $148,711.61; Payne Construction Co., Oakland, $150,565.08; W. B. Willett Co., Sacramento, $151,033.50; James P. Morton, Placerville, $157,705.78; R. G. Clifford and C. O. Bodenhamer, Berkeley, $169,747; Bos Construction Co., Berkeley, $171,125.60. Contract awarded to Barton Construction Co. and B & B Steel Erectors, Richmond, $139,667.

IMPERIAL COUNTY—Between Coyote Wells Underpass and Plaster City (portions), about 4.6 miles in length, road-mixed surfacing to be placed over existing surfacing and seal coat applied. District XI, Route 12, Sections A,B. Marks Bros. Construction Co., El Centro, $41,208; L. A. Rankin & Arthur G. Booth, Playa Del Rey, $43,981. Contract awarded to E. S. & N. S. Johnson, Fullerton, $38,245.

MODOC COUNTY—Across the track of the Southern Pacific Co., about 21.4 miles southeast of Tulelake, portions of an existing overhead to be removed, existing structural steel girders to be strengthened and raised, and new reinforced concrete abutments, deck slab and approach spans to be constructed and approaches and detour to be graded and surfaced. District II, Route 210, Section B. R. E. Hertel, Sacramento, $44,277; Stanley H. Koller Constructor, Crockett, $47,620; Gibbons & Zick, Alturas, $48,000; Bos Construction Co., Berkeley, $57,785.50; Chaney Construction Co., Los Angeles, $58,762.50. Contract awarded to B. S. McElderry, Berkeley, $42,869.90.

SAN BERNARDINO COUNTY—In and adjacent to the City of Ontario, at the intersection of Route 26 with Vineyard Avenue, traffic signal system, highway lighting and channelization. District VIII, Route 26. Ed Seymour, Long Beach, $11,299; Fischbach & Moore, Inc., Los Angeles, $11,390; Electric & Machinery Service, Inc., South Gate, $11,729; Drury Electric Co., San Bernardino, $17,402. Contract awarded to Paul R. Gardner, Ontario, $10,335.10.

EARL WARREN
Governor of California

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FRANK B. DURKEE
Director of Public Works

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HIGHWAY COMMISSION

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H. STEPHEN CHASE . . . . . Sacramento
JAMES A. GUTHRIE . . . . . San Bernardino
F. WALTER SANDELIN . . . . . Ukiah
CHESTER H. WARLOW . . . . . Fresno
CHARLES T. LEIGH . . . . . San Diego
R. C. KENNEDY, Secretary . . . . . Sacramento

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R. M. GILLIS . . . . Deputy State Highway Engineer
CHAS. E. WAITE . . Assistant State Highway Engineer
EARL WITHYCOMBE . Assistant State Highway Engineer
F. W. PANHORST . . Assistant State Highway Engineer
J. W. VICKREY . . Assistant State Highway Engineer
R. H. WILSON . . . Assistant State Highway Engineer
F. N. HVEEM . . . Materials and Research Engineer
GEORGE F. HELLESOE . . . . Maintenance Engineer
J. C. YOUNG . . . . . Engineer of Design
G. M. WEBB . . . . . Traffic Engineer
DON G. EVANS . . . . . Construction Engineer
H. B. LA FORGE . Engineer of Federal Secondary Roads
C. E. BOVEY . Engineer of City and Cooperative Projects
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H. C. McCARTY . . . . . Office Engineer
J. C. WOMACK . . . . . Planning Engineer
J. P. MURPHY . . . . Principal Highway Engineer
F. M. REYNOLDS . . . . Principal Highway Engineer
E. J. SALDINE . . . . Principal Highway Engineer
I. O. JAHLSTROM . . . . Principal Bridge Engineer
STEWART MITCHELL . . . Principal Bridge Engineer
E. R. HIGGINS . . . . . Comptroller

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E. F. WAGNER . . . Deputy Chief Right of Way Agent
GEORGE S. PINGRY . . . . . Assistant Chief
R. S. J. PIANEZZI . . . . . Assistant Chief
E. M. MacDONALD . . . . . Assistant Chief

District IV

B. W. BOOKER . . Assistant State Highway Engineer

District VII

P. O. HARDING . . Assistant State Highway Engineer

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J. W. TRASK . . . . . District II, Redding
A. M. NASH . . . . . District III, Marysville
J. P. SINCLAIR . . . . . District IV, San Francisco
L. A. WEYMOUTH . . . . District IV, San Francisco
E. J. L. PETERSON . . . . District V, San Luis Obispo
E. T. SCOTT . . . . . District VI, Fresno
W. L. FAHEY . . . . . District VII, Los Angeles
E. T. TELFORD . . . . . District VII, Los Angeles
C. V. KANE . . . . District VIII, San Bernardino
MILTON HARRIS . . . . . District IX, Bishop
JOHN G. MEYER . . . . . District X, Stockton
E. E. WALLACE . . . . . District XI, San Diego
HOWARD C. WOOD . . . . . Bridge Engineer
State-owned Toll Bridges



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GEORGE C. HADLEY . . . . . Attorney
HOLLOWAY JONES . . . . . Attorney

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Assistant State Engineer, Water Resources Investigations, Central Valley Project, Irrigation Districts
MAX BOOKMAN
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KENNETH C. ADAMS, *Editor*
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SEP 15 1953

Feather River Project Highway Relocation

Oroville Dam Will Be Huge Facility

21 Miles of Present Route Are Affected

GOVERNOR EARL WARREN, in a recent telecast, reported on accomplishments of the 1953 Legislative Session on water matters, particularly the progress being made in connection with the Feather River Project. This project, the Governor stated, is the greatest undertaking of its kind ever attempted. He reported that the Legislature had authorized an additional $750,000 for continuation of studies necessary before construction of the project can be undertaken.

Construction of the Feather River Project by the State of California, acting through its Water Project Authority, was authorized by the Legislature in 1951. The legislative act authorized construction of the units set forth in the publication of the State Water Resources Board entitled "Report on Feasibility of Feather River Project and Sacramento-San Joaquin Delta Diversion Projects proposed as features of the California Water Plan," dated May 15, 1951.

The same act directed the Department of Public Works, through the State Engineer, to conduct the necessary investigations, surveys and studies and to prepare plans and specifications for the project, but made no money available for carrying out the work. However, the Legislature of 1952 appropriated $800,000 for performing the work directed by the act. The additional amount of $750,000 appropriated by the 1953 Legislature for the Fiscal Year 1953-54 is to complete the studies under way with the objective of preparing a report for submission to the Water Project Authority in which recommendations would be made with reference to the financing and construction of the project.

Oroville Dam

The Feather River Project as presently contemplated includes the Sacramento Valley Unit, the San Joaquin Valley Unit, the San Francisco Bay Unit and the Southern California Unit.

The Sacramento Valley Unit comprises the Oroville Dam and Reservoir, Oroville Power Plant, Oroville Afterbay Dam and Power Plant and an electric transmission system to a Bethany Substation in Contra Costa County. The Oroville Dam, creating the Oroville Reservoir with a storage capacity of 3,500,000 acre-feet, would be located about five miles above Oroville. The dam would be 710 feet high above streambed level and would have a total crest length of about 6,850 feet. The main concrete dam across the channel of the Feather River would be 5,040 feet long. The spillway dam in a saddle on the right abutment would be 810 feet in length and would be joined to the main dam by 1,000 feet of earthfill dike.

Oroville Reservoir

Construction of the reservoir would require the relocation of sections of the Western Pacific Railroad and state highway, and would destroy the existing 70,000-kilowatt Las Plumas Power Plant of the Pacific Gas and Electric Company. The Oroville Power Plant, which would have a capacity of 440,000 kilowatts, would be located directly across the streambed at the base of the dam. An afterbay dam would be located 4½ miles downstream from the main dam for re-regulation of power releases. Another power plant of 25,000 kilowatts capacity would be located below this dam. It is contemplated that there would be three 230-kilovolt transmission circuits, to transmit the electric energy generated, from the power plants to the substation near Bethany, west of the Sacramento-San Joaquin Delta.

Studies made indicate that there are available in the channels of the Sacramento-San Joaquin Delta for a period of five to eight months of every year 600,000 acre-feet of surplus water monthly. With the Oroville Reservoir operated for flood control and to supply water for all requirements in the Feather River Service Area, sufficient releases could be made to supplement these surplus waters to permit a constant diversion from the delta of about 3,930 second-feet, which is equal to 2,845,000 acre-feet annually. At the same time an average of 1¾ billion kilowatt hours of electric energy would be generated annually.

The 14,000,000 cubic yards of concrete required for the Oroville Dam would be about one-fourth more than the amount in the Grand Coulee Dam and more than twice the amount used in Shasta Dam.

The proposed relocated line of the Western Pacific Railroad would be about 23.4 miles long and would replace 27.1 miles of existing line.

Feather River Highway

About 21 miles of present State Highway Route 21 (Sign Route No. 24), the Feather River Highway, would be replaced by a relocated line. The position of the high Oroville Dam immediately above the existing highway bridge across the Feather River, and the arm of the reservoir extending up the deep canyon of the West Branch of the Feather River, are controls that preclude developing a relocation in the Feather River Canyon along the reservoir border. Of several alternative routes studied the most favorable from all standpoints is that from Oroville to Jarbo Pass via Table Mountain, Cherokee, and Yankee Hill. On this tentative relocation new bridges would be required across the Feather River at Oroville and the West Branch of the river beyond Cherokee. The bridge over the West Branch would be unusually high and long and would have separate decks for the relocated highway and the Western Pacific Railroad, similar to the joint structure built over the Pit River for the Shasta Reservoir project.

Seventeen Miles of New Construction

The proposed replacement of the existing highway would require about 17.5 miles of new construction. The estimated cost, exclusive of the highway-railroad bridge over West Branch, is approximately $5,000,000. The new facility will be designed on standards equal to the present highway section that would be superseded. The Division of Water Resources is obtaining photogrammetric maps as a basis for projecting plans for the highway relocation. Highway plans will be prepared by the Division of Highways using funds made available by the Legislature for studies of the Feather River Project.

San Joaquin Valley Unit

The San Joaquin Valley Unit of the Feather River Project would divert project water from the Sacramento River through a cross channel to the westerly area of the Sacramento-San Joaquin Delta from which it would be lifted to provide water for the west side of the San Joaquin Valley and for the Southern California and San Francisco Bay units. The diversion from the delta would be from Italian Slough, a tributary channel of the Old River channel of the San Joaquin River. The intake canal is being designed for a capacity of 6,000 second-feet. The San Joaquin Valley unit includes the intake channel, five pumping plants and canals between the pumping plants running to the southerly end of the valley and terminating at Pastoria Creek three miles east of Grapevine. The pumping plants would raise the water from the delta at tidewater elevations varying from –0.4 foot to 5.9 feet maximum, to a maximum elevation of 1,500 feet. Water would be lifted from the terminus of the intake channel to the canal at elevation 225 feet.

Line of Canal

The canal would parallel the Delta-Mendota Canal of the Central Valley Project to a point at San Luis Creek at which point a pumping plant would lift the water to elevation 400 feet. The canal would then follow on grade contour along the west side of the San Joaquin Valley to the Buena Vista Hills where another pumping plant would lift the water to elevation 500 feet. The canal would then follow the foothills at the southern end of the San Joaquin Valley to Wheeler Ridge where two pumping plants would raise the water to the 1,500-foot elevation. A canal would then run along the south side of Wheeler Ridge and continue, on grade contour, to Pastoria Creek. The total length of canal to this point would be about 295 miles.

The San Francisco Bay Unit would divert water from the main canal of the San Joaquin Valley Unit at a point about 1.5 miles from the first pumping plant, at which point a single lift would raise the water to an elevation of about 720 feet. The water would be conveyed through the Coast Range in a tunnel about 7,000 feet long into the Livermore Valley. Studies are being made of conduits which would carry the water to terminal storage reservoirs to serve areas in Alameda, Santa Clara, San Benito, and San Mateo Counties.

Southern California Unit

The Southern California Unit of the Feather River Project would start with a pump lift at Pastoria Creek which would raise the water to an elevation of 3,357 feet at the portal of the first of two tunnels through the Tehachapi Mountains aggregating 10.5 miles in length. From the outlet portal of these tunnels, located at the divide between the Santa Clara River Basin and the desert, near Quail Lake, a conduit of canals and tunnels on grade contour would extend to Barrett Reservoir in San Diego County. The conduit after leaving the tunnels would extend along the Antelope Valley on the desert side of the mountains, passing about 270 feet above the Fairmont Reservoir on the Los Angeles Aqueduct. It would cross Amargosa Creek and follow the south side of that creek about 470 feet in elevation above the Palmdale Reservoir, cross Soledad Pass at Vincent and Little Rock Creek below the Little Rock-Palmdale Dam. The course of the conduit would then be easterly across the Mojave Desert to a portal of a three-mile tunnel on the Mojave River, terminating in Devils Canyon, a tributary of the Santa Ana River and a source of water for the City of San Bernardino. The conduit would then be a series of tunnels following the south slope of the mountains north of San Bernardino and Redlands southerly to a siphon across the San Gorgonio Pass between Beaumont and Banning. The course of the conduit would then bear southerly along the mountains east of the San Jacinto Valley, passing above Lake Henshaw on the San Luis Rey River and crossing the headwaters of the San Diego and Sweetwaters Rivers, to a terminus at a tributary of the Tia Juana River that runs into the reservoir created by Barrett Dam. The total length of the conduit would be about 580 miles from the point of diversion in Italian Slough in the San Joaquin Delta.

The objective of the Southern California Unit would be to furnish water to supplement existing supplies including California's rights to the Colorado River, presently available to the areas south of the Tehachapi Mountains. It must be considered an additional, not a substitutional, supply for that area.

Studies Well Under Way

Field surveys and office studies are under way of an alternative route which could deliver water on the west side of the San Gabriel Mountains, rather than on the desert side, by means of a tunnel at elevation 1,500 feet which would extend from a portal at Pastoria Creek a distance of 27 miles to a portal on Castaic Creek.

Work has been in progress on the Feather River Project studies for the past year. Nine contracts have been executed for photogrammetric mapping of portions of the project. The contracts include the mapping of the relocations of the Western Pacific Railroad, Highway Route 21, the Feather River Railway and the Oroville-Feather Falls County Road, made necessary by the construction of Oroville Reservoir. The Oroville dam site has also been mapped at a scale of 50 feet to the inch. Five of the aforementioned contracts are in progress for the mapping of 445 miles of the conduit route from Italian Slough to the north line of Fresno County and from Tupman in Kern County to Barrett Reservoir in San Diego County. The portion between the north line of Fresno County

... Continued on page 32

CALIFORNIA AGAIN WINS NATIONAL AWARDS FOR EXCELLENCE IN TRAFFIC SAFETY ACTIVITIES

GOVERNOR WARREN, on behalf of the State of California, has accepted three national awards for excellence in traffic safety activities for 1952.

The awards were for first places in traffic engineering and traffic enforcement and for outstanding achievement in driver licensing. This marks the third consecutive year that the State has won highest honors in enforcement and engineering.

The winning scores were based on the annual inventory of traffic safety activities which the National Safety Council and a number of technical and educational organizations conduct each year.

California, for comparison purposes, is grouped with seven other states with major traffic problems: New York, Pennsylvania, Ohio, Michigan, Indiana, Illinois and Texas.

Third Consecutive Year

For the second consecutive year California has been awarded first place on a national basis for outstanding achievement in traffic engineering. The Institute of Traffic Engineers, the judging agency, recently announced a first place tie between California and Michigan in the 1952 Annual Inventory of Traffic Safety Activities. The 1952 award marks the third consecutive year in which California has won or tied for first place in its class, which comprises the highly populated and heavily trafficked states.

Ratings are based on a comprehensive report which includes the highway organization, degree of control and aid given to cities and counties, the number of persons engaged in traffic engineering functions, and man-hours involved in the various types of traffic engineering studies. Accomplishments during the year in added traffic control devices such as signs, highway and railroad signals and separations, highway lighting, hazardous locations improved, miles of highways: with center line maintained, curves and no-passing zones regularly marked, etc., are an important factor of the report. Major construction accomplishments such as miles of highways by lanes, and number of bridges constructed, are given less weight.

California Consistent Winner

Prior to 1949 California had been grouped with the 11 western states. Under this classification, California had been ranked first in the group for both the years 1947 and 1948. It is interesting to note the improvement in this State's ratings as issued by the National Safety Council. California's traffic engineering program was appraised at 83 percent in 1947, while the 1952 award was based on a 95 percent performance.

Due to the variations between states in size and amounts of highway travel,

. . . Continued on page 40

Governor Warren presents traffic safety awards to department heads. Left to right: A. H. Henderson, Director of Motor Vehicles; Milo L. Hewitt, Supervising Inspector, Highway Patrol; Governor Warren; State Highway Engineer George T. McCoy.



Real Progress

U. S. 99 Now Four-lane Divided Highway for 115 Miles

By HARRISON R. BAKER, State Highway Commissioner

Events happen to our highways that are scarcely noticed by the motoring public. Construction goes on, slight delays are encountered, the motoring public keeps on traveling our roads, and first thing you know we have miles and miles of four-lane divided highways and nobody thinks much about it.

Way back in 1940, December 14th, to be exact, the first of 37 contracts was let by the State Division of Highways for a revamping of the Ridge Route. And then World War II came along and construction stopped. In 1947 the State started in again to do the job of reconstruction on the Ridge Route.

The State, for administrative purposes, is divided into 11 districts by the Division of Highways, and it so happens that work on the longest stretch of four-lane divided highway came under the jurisdiction of two districts. District VII has responsibility for the 45 miles in Los Angeles County, and District VI has responsibility for the 70 miles in Kern County.

First Contract Let

The first of the many contracts for reconstruction was in District VI and covered from Fort Tejon to 1.4 miles north of Grapevine Station. Since that time both districts have been working steadily on the "face lifting" job of the Ridge Route.

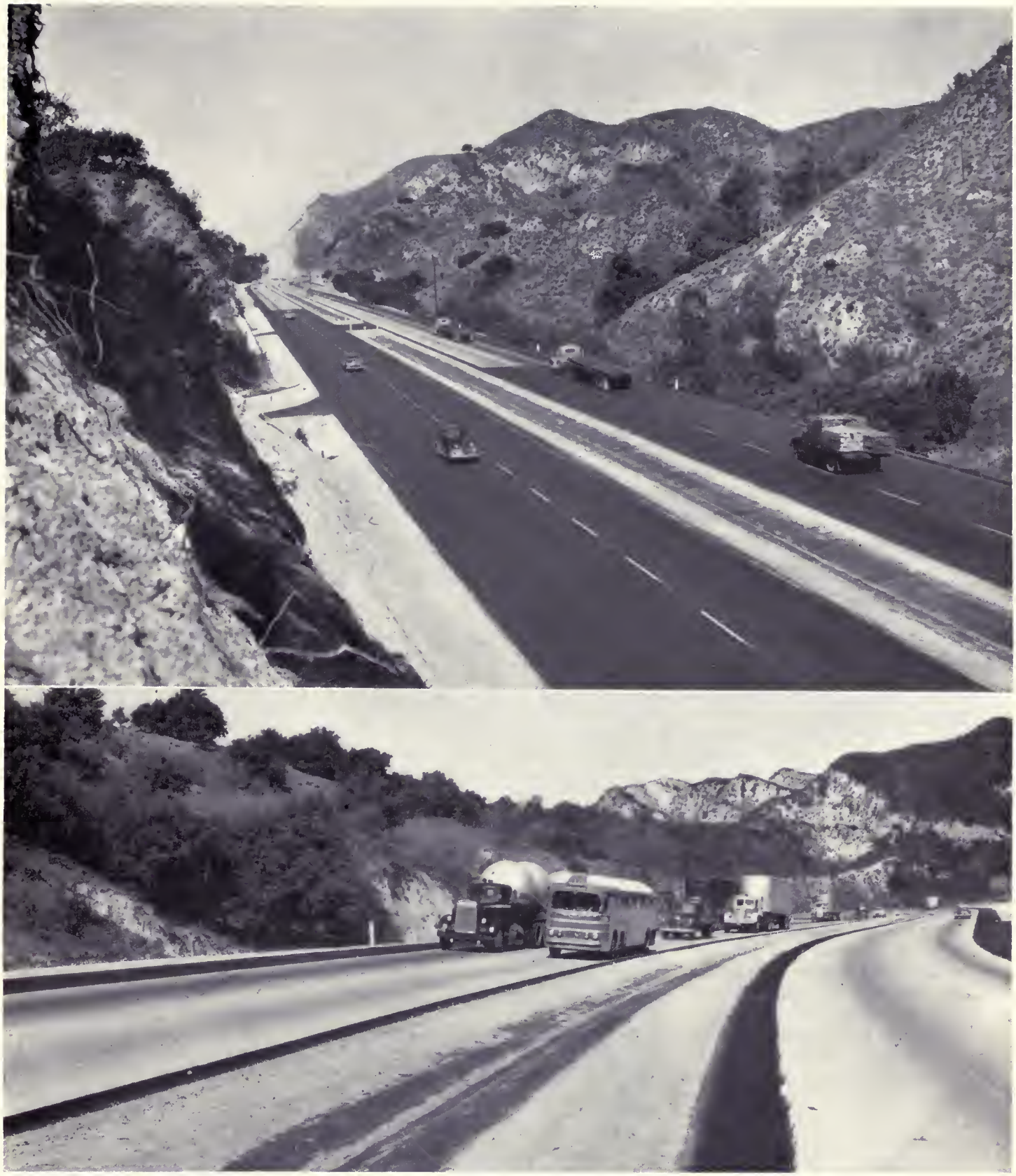
During the past six years District VII has let 15 U. S. 99 reconstruction contracts for a total of $13,493,760 and District VI has let 22 reconstruction contracts for a total of $12,125,010. Included in the above amounts is $1,796,100 for right of way in District VII and $2,102,000 for right of way in District VI. Six bridges have been built in District VII and four bridges in District VI.

The last of the reconstruction contracts has been completed and the motoring public of California now has the use of 115 miles of continuous four-lane divided highway from Tunnel Station at the north city limits of Los Angeles to the Delano Underpass in Kern County near the Tulare county line. This is the longest stretch of continuous four-lane divided highway in our State at the present time. The average motorist does not realize that there is this 115-mile-long continuous stretch of four-lane divided highway now at his disposal. It has happened gradually.

U. S. 99 is a north and south traffic arterial of very great value connecting the productive San Joaquin Valley and Sacramento Valley with the Los Angeles metropolitan residential and industrial areas. The importance of this

Weldon Conyon section of Ridge Route looking southerly from Weldon Summit, showing typicol use of this highway by trucks





UPPER—Looking northerly along Weldon Canyon section of Ridge Route toward Weldan Summit. LOWER—Looking southerly along Weldon Canyon toward Wiley Canyon. Photograph shows traffic congestion that can occur even on a modern, four-lane, divided highway when heavy vehicles traveling at approximately the same speed attempt to pass each other on upgrades.



UPPER — View looking southerly through Weldon Summit, showing flattening of excavation slope on left in order to eliminate possibility of slides occurring that might obstruct highway. LOWER—Looking southerly along Ridge Route, showing junction with State Route 79 leading easterly to Saugus.



state highway is indicated by the fact that during the past five years the increase in traffic volume has been about 10 percent per year. Because of the importance of the Ridge Route as a heavily traveled truck road very necessary to the industrial and economic life of the Los Angeles metropolitan area, it is interesting to speculate on its value to the motorists and to the people of the State. As detailed above, the cost of the reconstruction job just completed on the 115 miles of four-lane divided highway was $25,600,000. Adding to this figure the cost of original construction, we find that this 115 miles has cost a total of $40,000,000. With this sum a capital asset of considerable value has been created. What is its worth on the books, based on earning power?

Traffic Counts

We find upon going to the traffic record that on this 115 miles there are 12 traffic count stations. The traffic count station showing the lowest 1952

count is centrally located at Lebec near the Los Angeles-Kern county line where a Monday 16-hour count was 8,706 vehicles. At the north city limits of Los Angeles the Sunday 16-hour count was 13,622 vehicles. The maximum count was at the station at Bakersfield where the Monday 16-hour count was 23,418 vehicles. A study of the results at all traffic count stations would indicate that a conservative average daily traffic figure for the Ridge Route would be 14,000 vehicles.

Traffic count figures indicate that about 15 percent of the traffic is trucks. To one driving the Ridge Route, this figure would seem extremely low. No doubt this is because the percentage is by numerical count only, and does not take into account either the size or the tonnage of the trucks. If we were attempting to get the proportion of trucks to passenger automobiles using the Ridge Route on the basis of total tonnage of each type of vehicle or perhaps the total area of highway occupied, then we would doubtless find that the trucks in bulk about equaled or even exceeded the passenger vehicle traffic. In any event we know this, that generally speaking, even on a numerical percentage basis there are half again as many trucks on the Ridge Route as are operating on other state highway routes, and that this is several times the percentage of trucks that usually operate on city streets. The fact that trucks utilize the Ridge Route to such a considerable extent is very clearly indicated by some of the photographs accompanying this story.

Now getting back to the problem of evaluating this 115 miles of divided highway. Perhaps the most logical approach would be to consider it as a toll road. I don't want to be misunderstood by out-of-state readers. The possibility of making the Ridge Route a toll road has never been considered. It has been completely paid for by public funds. It was paid for largely from gasoline tax funds and there is no intention of making it a toll road even though this is one state highway passing through a type of terrain that would be very adaptable to installation of toll collecting stations. We are at this time merely thinking about it as a toll road for the purpose of arriving at an estimate of its present worth to the people of California. Certainly it is the type of facility which would warrant a charge of one cent per vehicle mile for automobile traffic and four cents per vehicle mile for trucks.



Weldon Conyon section of Ridge Route, looking northerly toward Pico Conyon Road

Figuring on this basis, 12,000 automobiles per day at 1 cent per mile would bring in $13,800 per day, which equals $5,037,000 per year. Two thousand trucks per day at 4 cents per mile would bring in $9,200 per day, which equals $3,358,000 per year. The total earnings per year would be $8,395,000. On this basis the total cost of the Ridge Route would be paid off in less than five years' time. If we take this yearly income and capitalize it at 4 percent, we find that this 115 miles of divided highway, built at a cost of $40,000,000, is actually worth $210,000,000. These figures are presented to indicate that the people of the State of California have gotten more than their money's worth for the state highway funds that have been invested in the Ridge Route. They can feel gratified that the job has been fully paid for and that through the years to come there will be no assessment of tolls.

Plans of the State Division of Highways are to have both U. S. Highway 101, the Coast Route, and U. S. Highway 99, the Valley Route, continuous four-lane divided highways from the Oregon line in the north to the Mexican border in the south. Work is continuously in progress modernizing both of these routes.

Waldo Project

Golden Gate Bridge Approach Widening Is Urgently Needed

By DRURY ELDER, Design Engineer

Construction will soon be in progress for widening the Waldo Grade, the north approach to the Golden Gate Bridge. The present four-lane section of highway between Manzanita and the Golden Gate Bridge, a distance of about four miles, is a vital line of U. S. 101 that carries an average daily traffic of about 25,000 vehicles. This highway carries a large load of peak-hour commuter traffic from Mill Valley and points north that presently reaches a maximum of about 2,800 vehicles per hour. Complex intersections serving the City of Sausalito enter the highway near both ends of the project.

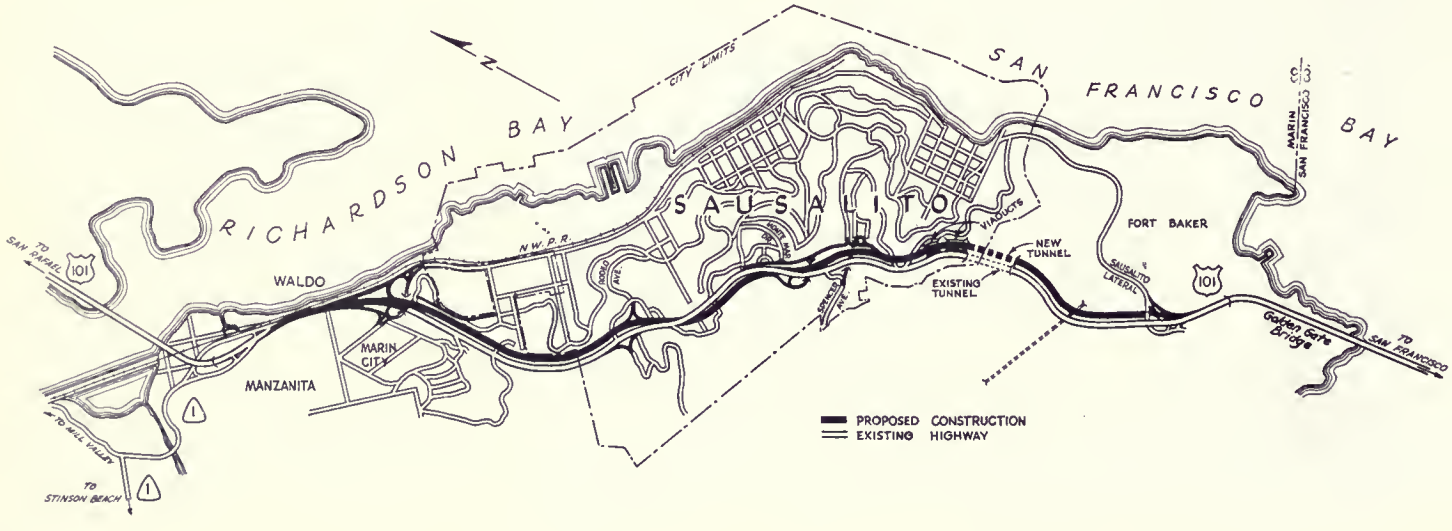
The need for expanded traffic capacity over this section of highway was first foreseen about seven years ago. Several alternate studies were made on various possible alignments. Alternates ranged from lines skirting Sausalito along the bay front; along the slope above the business section of Sausalito to studies relating to widening of the present facility. Widening of the existing alignment was finally adopted as being the most feasible consistent with proper traffic service and the least interference to existing improvements. The four-mile improvement will entail the removal of only four dwellings and two service stations.



Looking sauth toward the Waldo Tunnel with a centerline af the three northbound lanes and the partal af the northbaund bare shawn in white

Declared a Freeway

This section of highway was declared a freeway by the California Highway Commission on May 15, 1947. Freeway agreements were executed with Marin County and the City of Sausalito in April of this year. Right of way is being acquired on a full freeway basis



with the purchase of access rights throughout. This will result in only four vehicular entrances to the freeway by means of traffic interchanges within the limits of the project.

Proposed improvement is planned to consist of converting the major portion of the existing highway to a three-lane highway for southbound traffic and constructing three new lanes for northbound traffic with curbed median throughout.

Planned in Two Stages

Execution of the work is planned in two stages. The first contract, which is planned to be let the latter part of this summer, is to consist of grading, structures and portions of base and surfacing required for the convenience of traffic. This project is expected to be completed about the end of 1954. The second contract, to follow immediately on completion of the first contract, will consist of base, surfacing, median curb throughout and final incidentals.

Most of the new construction will be along the easterly side of the present road, except for about 3,000 feet in the central portion of the project, where the new construction will be along the west side of the existing road.

New Highway Tunnel

Major structures will consist of a new highway tunnel, two sidehill viaducts, a new undercrossing, a new overcrossing, extension of two existing undercrossings and extension of a military tunnel that passes under the freeway.

The new highway tunnel will be a reinforced concrete-lined tunnel 1,000 feet long providing a clear roadway width of 40 feet with one 4-foot and one 2-foot 6-inch sidewalk. It will be located parallel to and easterly of the existing Waldo Tunnel and will accommodate northbound traffic.

The two sidehill viaducts will be situated immediately north of the new tunnel and will be reinforced concrete girder structures about 270 feet and 318 feet long respectively, each providing a clear roadway width of 40 feet.

Traffic Interchange

A traffic interchange is required near the summit of Waldo Grade to serve Sausalito traffic in that area. Because the terrain is on a steep hillside slope, this interchange varies somewhat from the usual conventional interchange types. It involves an overcrossing at Spencer Avenue consisting of a reinforced concrete girder bridge about 314 feet long

Looking north from a point above the Fort Cronkhite Tunnel portal to the site of the twin Waldo Tunnel bore. The centerline of the proposed three northbound lanes and the new northbound tunnel are shown in white.





This photo shows the southerly terminus of the proposed widening project and the Marin end of the Golden Gate Bridge with San Francisco in the background and the Bay Bridge on the extreme left

providing a clear roadway width of 26 feet and one 5-foot sidewalk. Also included in the interchange is an undercrossing about midway between Spencer Avenue and Monte Mar Drive which will consist of a reinforced concrete rigid frame bridge 147 feet long by 35 feet clear span with a 5-foot sidewalk.

Improvement of the existing interchanges at the Sausalito lateral near the south end of the project and at Waldo near the north end of the project will require extension of undercrossings existing at those locations.

Military Tunnel Extension

The southerly portion of the project passes through the Fort Baker military reservation. A long military tunnel passing under the highway and serving the upper portion of the reservation will require extension on the easterly end. This extension will be a reinforced concrete arch structure about 108 feet long providing a clear span of 20 feet.

During public hearings relating to freeway agreements for this project, the residents of Marin County were assured that traffic interference would be held to a minimum during construction of this project. This presented quite a problem with respect to the transporting of earthwork material from excavation on one side of the highway to embankment on the opposite side without hauling across the existing traveled way.

Steep Terrain

Because of the steep terrain, the toe of embankment slopes will extend a maximum of about 710 feet from highway centerline at an elevation approximately 300 feet below highway grade. The top of cut slopes will extend a maximum of 630 feet from centerline at a maximum elevation of about 290 feet above highway grade. Most cut and fill slopes will be benched with 20-foot to 40-foot benches.

About midway of the project, approximately 650,000 cubic yards of excavated material must be obtained from the west side of the highway for use in embankments along the east side. The problem of getting this material across the highway without interfering with traffic was solved by planning the construction of Monte Mar Undercrossing in two stages in such a manner that, after the first portion of the structure is completed on the west side, about 510,000 cubic yards can be transported through the undercrossing for disposal east of the highway. In order to distribute the remainder of this cut in embankments to the north along the east side of the highway, a 60-inch tunnel liner is planned through a deep fill which will accommodate a conveyor belt. After serving its purpose as a conveyor belt tunnel, the tunnel liner will become a part of the final drainage system required on the project.

Photogrammetric Surveys

Design of this project was accomplished largely through the medium of contours determined by aerial photogrammetric surveys. This resulted in a great economy in the cost of preliminary surveys, which would have otherwise run much higher than average cost because of the steep rugged terrain in this area. Ground surveys were reduced to a minimum consisting of only such survey work as was required where tight line and grade controls were necessary.

Waldo Grade, serving as the north approach to the Golden Gate Bridge, is to be financed largely from Golden Gate Bridge toll revenue. A legislative act has provided $5,000,000 to finance a large share of the cost of the widening project. This sum is to be repaid from bridge tolls to the Bond Sinking Fund of 1943 in the State Treasury. The remainder of the cost is to be provided from the State Highway Fund.

Artesia Street

State Highway Route 175 in Los Angeles Is Standardized

By WILLIAM D. McGINNIS, Assistant Highway Engineer

With the tremendous increase in population in the southeastern portion of the greater Los Angeles area in recent years, an ever increasing need for a good east-west highway has become evident. There is at present no consistently good east-west road between Pacific Coast Highway (Long Beach) and Firestone Boulevard, a distance of 11 miles. Artesia Street, being about half way between Pacific Coast Highway and Firestone Boulevard, presented an ideal location for such a highway development.

The improvement of Artesia Street to modern state highway standards was divided into three road construction contracts, one bridge construction contract with approaches, and one signal contract. With the utilization of the existing bridge over the Los Angeles River and bridge approaches, there is being provided a continuous length of approximately 6.25 miles of modern four-lane highway. This bridge, costing $640,000 was completed in 1949 under a City of Long Beach contract financed from the former city ¼-cent gas tax fund for state highways.

First Contract 2.47 Miles

The first contract, let to Warren Southwest, Inc., was from the San Gabriel River to Downey Avenue, a length of 2.47 miles. The existing roadway in this section consisted of both two- and three-lane concrete pavement with penetration treatment shoulders in poor condition, and no curbs or gutters. The construction completed on this section provided for widening and surfacing with plant-mix to give a four-lane divided highway with parking lanes and curbs throughout, and with left-turn lanes at all major intersections. The construction of curbs was necessary to handle drainage properly, and since the completion of the job a great many of the property owners at their own expense have had sidewalks constructed.



Cutting ribbon at Artesia Street ceremonies. Left to right: Ana Saueressing, Shirley Saueressing, and Assistant State Highway Engineer Paul O. Harding.

The alignment was changed between Bixby Avenue and Woodruff Avenue so as to eliminate two right-angle turns. The old alignment had a right-angle turn at Woodruff Avenue coming from the west, and then went south for approximately 700 feet, and then another right-angle turn to the east. These right-angle turns were eliminated by the constructing of two easy riding curves between Bixby Avenue and Woodruff Avenue.

Excavation Problems

This particular contract was unique in that all the roadway excavation and overhaul were redesigned during construction. The original plan was to excavate to two feet below profile grade, replacing the bottom one foot with select material from within the job limits, on top of which was to be placed eight inches of untreated rock base and four inches of plant-mixed surfacing. The excess material was to be hauled and placed in a designated embankment for the Long Beach River Freeway, a distance of approximately three miles from the west end of the contract.

This plan became impractical when it was discovered that due to a high-water table and a saturated clay soil, the contractor's equipment bogged down continually while attempting to place and compact the selected material. A new plan was then formulated. If, after excavating one foot, the underlying material was stable, the ground was then compacted to 90 percent and the untreated rock base and plant-mixed surfacing were placed thereon. If, after excavating one foot, the material appeared to be unstable, the excavation was then made to two feet below finish grade, and one foot of imported subbase material was placed before placing the untreated rock base and plant-mixed surfacing.

Opening Ceremony

On March 20, an official opening ceremony was held for this $460,000 contract at the corner of Bellflower Boulevard and Artesia Street. Several brief talks were given outlining the history and development of Artesia Street, a ribbon was cut with appropriate formalities, and the ceremony was climaxed by a parade of vehicles through the completed job representing the various modes of transportation that have been used on Artesia Street down through the years. These included a horse-drawn carriage, various old-time cars, and finally, the very latest 1953 model automobiles. Representing the Division of Highways at the ceremony were P. O. Harding, Assistant State Highway Engineer, and W. L. Fahey and E. T. Telford, District Engineers.

Before the completion of this first contract, another contract had already been let to M. S. Mecham & Sons for the improvement of Artesia Street



Artesia Street looking easterly shawing typical construction operations now in progress between Alameda Street and Long Beach Boulevard

from Downey Avenue west to Long Beach Boulevard. There was a break in this contract between Atlantic Avenue and Butler Avenue, where the previously mentioned existing facilities over the Los Angeles River and the bridge contract over the future location of the Long Beach River Freeway were located, thus giving a net length of 2.38 miles.

The existing roadway in this section, which was entirely within the City of Long Beach, consisted of a two-lane concrete roadway resurfaced with plant-mix, from Downey Avenue to the Union Pacific Railroad crossing. From the Union Pacific Railroad crossing to Atlantic Boulevard there was a four-lane roadway partly of resurfaced concrete, some new plant-mixed surfacing on an untreated rock base, and on penetration treated base. The remaining section from Butler Avenue to Long Beach Boulevard was a two-lane roadway of road-mix pavement in poor condition. There was curb and gutter on both sides from Atlantic Avenue to Cherry Avenue, and on the north side from Paramount Boulevard to Hammond Avenue.

The construction on this contract provided for a four-lane divided highway with parking lanes and left-turn lanes in the division strip at intersections. The portions of the roadway that were over a good existing base

View looking northerly showing bridge carrying Artesia Street, State Highwoy Ra ste 175, aver the Long Beach Freeway. This view indicates grading construction activity an the Long Beach Freeway.





Completed Artesia Street improvement looking easterly from the Los Angeles River Bridge. The intersecting street in center of photograph is Atlantic Boulevard, State Highway Route 167.

were resurfaced and the remaining areas were excavated to two feet below finished grade, except where a relative compaction of 90 percent was encountered sooner, with one foot of either select material or imported subbase material being placed under eight inches of untreated rock base and four inches of asphalt concrete. The existing curb and gutter on the north side from Atlantic Avenue to Cherry Avenue was left in place, but the curb on the south side was removed and new curb constructed 10 feet to the south, so as to provide for the additional width of roadway.

Excess Excavation

The excess excavation from this job was placed in an embankment for the Long Beach River Freeway immediately to the south of the one for the previous contract. The total embankment placed from these two contracts on the Long Beach River Freeway was approximately 30,000 cubic yards. This contract was completed on April 21, at a total construction cost of $348,000.

Presently under construction are two additional contracts which will carry improved Artesia Street from Long Beach Boulevard to its present western terminus at Alameda Street. The first of these contracts, let to M. S. Mecham & Sons, provides for widening and paving so as to provide a four-lane divided roadway from Long Beach Boulevard west to the Southern Pacific Railroad Crossing, a distance of 0.79 miles. The second contract from the Southern Pacific Railroad to Alameda Street was largely a traffic

Looking easterly along completed Artesia Street improvement. The intersection in the foreground is with Lakewood Boulevard, State Highway Route 19B.





Looking easterly showing construction operations in progress near Alameda Street. This photograph indicates type of traffic that has to be handled through construction.

signal installation contract, being only 85 feet long. This contract was awarded to Westates Electric Construction Company. The subcontractor for the grading and paving operations on this contract was M. S. Mecham & Sons. The resident engineer on this signal installation contract was Ray E. DeGroff. On all three of the Artesia Street road contracts, L. W. Sixt was the resident engineer.

Completely New Construction

The improvement from Long Beach Boulevard to Alameda Street provides for completely new construction, with the exception of the utilization of 500 feet of existing curb on the north side of Artesia Street. The structural section provided one foot of imported subbase material under eight inches of untreated rock base, topped with four inches of asphalt concrete. The improvement replaces a two-lane road-mix pavement in very poor condition. The last 1,000 feet of this contract are being constructed on an interim or temporary basis as the ultimate plan calls for a grade separation to be built over the Southern Pacific Railroad tracks, Alameda Street, and Compton Creek immediately to the west of Alameda Street.

. . . *Continued on page 55*

View looking upstream showing the bridge carrying Artesia Street, State Highway Route 175, over the Los Angeles River



Ramona Freeway

Construction Completed From Los Angeles City to Alhambra Front Door

When the one-mile length of construction between Fremont Avenue and Atlantic Boulevard in Los Angeles was completed by Griffith Company, contractor, on May 26, about 6.2 miles of completed Ramona Freeway were brought from Aliso Street in Los Angeles to the front door of the City of Alhambra. The city officials and the Alhambra Chamber of Commerce considered this to be a milestone worthy of celebration.

Celebrating this important event a brief ribbon cutting ceremony was conducted by the Alhambra Chamber of Commerce at 11 a.m. on May 26th. Representing the City of Alhambra were the following: Thomas D'Arcy Quinn, Mayor, Alhambra; Edwin A. Ingham, City Manager, Alhambra; W. M. Jarrett, City Engineer; Joseph Chambers, President, Alhambra Chamber of Commerce; L. VanTongren, manager, Alhambra Chamber of Commerce; Diane Hurley, Queen of Hi-Neighbor Days Celebration.



Ribbon cutting ceremony on Ramona Freeway at Fremont Avenue showing from left to right: Assistant State Highway Engineer P. O. Harding, State Highway Commissioner Harrison R. Baker, Miss Diana Hurley, Queen of Hi-Neighbor Day's Celebration, City of Alhambra, Thomas D'Arcy Quinn, Mayor of City of Alhambra, and Joseph Chambers, President of Alhambra Chamber of Commerce

View looking westerly toward Fremont Avenue showing caravan of official cars using the outbound roadway immediately upon completion of ribbon cutting ceremony





View looking westerly from Marengo Avenue showing newly completed Ramona Freeway outbound lanes immediately after ribbon cutting ceremony

Representing the State Division of Highways were: Harrison R. Baker, State Highway Commissioner; P. O. Harding, Assistant State Highway Engineer; W. L. Fahey, District Engineer; Edward T. Telford, District Engineer; F. B. Cressy, District Construction Engineer; B. N. Frykland, Resident Engineer; Warren James, Bridge Department Representative.

Representing Griffith Company, contractor, were: J. F. Porcher, General Superintendent, and H. G. McGregor, Bridge Superintendent.

The cost of this contract was $1,426,000 and the work was started on August 8, 1951. It is interesting to note that the contractor prosecuted the work with energy and initiative and completed it about seven weeks ahead of the allotted time.

This ribbon cutting ceremony was a notable event, particularly for this reason. It was the first ribbon cutting ceremony to be held in connection with Ramona Freeway construction, notwithstanding the fact that as of this date a total of 26 construction contracts have previously been completed. It is of interest to note that over the 52-mile length of Ramona Freeway, from Aliso Street in the City of Los Angeles to the west city limits of Colton in San Bernardino County, $28,000,000 have been spent and obligated by the State Divi-

. . . Continued on page 53

View looking northerly along Atlantic Boulevard, State Highway Route 167, showing completed bridge to carry Ramona Freeway over Atlantic Boulevard



Long Beach Freeway

By EDWARD T. TELFORD
District Engineer

Phenomenal Traffic Increase Gives Impetus to Project

A STUDY has just been completed of the postwar growth in traffic for the area easterly of the location for the Long Beach Freeway, that was formerly called "Los Angeles River Freeway." The area studied is bounded by state highway routes as follows: Route 167 (Atlantic Boulevard), Route 168 (Rosemead Boulevard), Route 174 (Firestone Boulevard) and Route 2 (Whittier Boulevard). This area, lying easterly of the City of Los Angeles, has experienced an unprecedented growth as rapid as has occurred in any area of Los Angeles County. The expansion has been equal to that in the San Fernando Valley and in the Lakewood area in Long Beach. But the growth is unique in that much of the increase is due to heavy industrial installations.

New Industries

An actual count has been made of the new industries constructed in this area since the end of World War II and it has been found that an additional 62 major industrial plants have been erected and put into operation. Typical of these are the new industrial plants of General Pipe and Supply Company, Thor Power Tool Company, North American Aviation, Inc., Libby McNeil and Libby, Crucible Steel Company of America and Lever Brothers' $25,000,000 soap manufacturing plant. With this industrial growth has come a corresponding traffic increase so that generally speaking we can say that the traffic on state highways and other thoroughfares in this area has doubled. The 16-hour July Monday traffic counts at our established traffic count stations are as follows:

Year	1 Jc. Rts. 166 and 167 Telegraph and Atlantic		2 Jc. Rts. 2 and 168 Whittier and Rosemead		3 Jc. Rts. 166 and 168 Telegraph and Rosemead			4 Jc. Rts. 167 and 174 Atlantic and Firestone		5 Jc. Rts. 168 and 174 Lakewood and Firestone	
	Rt. 166 E. of Rt. 167	Rt. 167 S. of Rt. 166	Rt. 2 W. of Rt. 168	Rt. 168 S. of Rt. 2	Rt. 166 W. of Rt. 168	Rt. 168 N. of Rt. 166	Rt. 168 S. of Rt. 166	Rt. 174 E. of Rt. 167	Rt. 167 N. of Rt. 174	Rt. 174 W. of Rt. 168	Rt. 168 N. of Rt. 174
1947	17,895	29,337	12,618	18,661	15,646	17,119	21,307	18,776	24,199	13,803	17,839
1948	14,613	32,309	11,834	23,884	17,725	17,720	21,925	23,176	21,775	16,246	19,870
1949	19,930	31,045	13,487	17,522	21,662	16,816	19,791	22,048	24,304	21,757	19,505
1950	22,720	34,459	16,889	28,693	25,666	26,284	31,718	30,015	31,327	25,416	25,601
1951	29,352	35,472	17,249	27,686	31,362	26,347	33,512	34,060	27,934	30,348	34,258
1952	32,517	40,999	18,237	29,035	35,163	26,687	38,637	31,038	31,362	44,535	31,189

Industrial Growth

Highway construction in this area by State and county has not kept pace with the industrial growth and development. Los Angeles County on December 18, 1951, paved a two-lane dip across the Rio Hondo Channel at the location of the old Foster Bridge, a short distance south of Telegraph Road, and immediately this carried a 24-hour volume of 2,545 with a 480-peak hour in one direction. The latest count, January 22, 1953, showed the 24-hour volume to be 9,257 with a peak hour of 1,460 in one lane. Some of this traffic will be directed to the Santa Ana Freeway and to Florence Avenue when present construction across the Rio Hondo is completed.

Another illustration of phenomenal growth of traffic is Washington Boulevard. The connecting section of Washington Boulevard between Telegraph Road and Vail Avenue was open to traffic in 1942. A 16-hour volume of 5,518 was counted here in December, 1945, and signals were installed in February, 1947, at the intersection with Telegraph Road. This section of Washington Boulevard is now carrying about 22,000 vehicles in 16 hours.

The area included on the *accompanying map* is estimated to be about 30 percent developed as a source of industrial and commuter traffic. Much of this traffic will be served by the Santa Ana Freeway. However, a major part of the traffic desires trips to the large residential sections to the north, to Montebello, to Monterey Park, to Alhambra, etc. The Long Beach Freeway with northerly extension is of high priority for this purpose.

Other Projects

Construction of Garfield Avenue in the section across the Union Pacific Railroad tracks is now under way by Los Angeles County and is scheduled for completion in January, 1954. The construction of Garfield Avenue from south of Clara Street to Gage Avenue is planned for 1954-1955 by the county, with right of way acquisition in the 1953-1954 budget. The beneficial effect of these two Garfield Avenue projects on present Atlantic



Airplane view looking southeasterly along Santa Ana Freeway showing traffic congestion on Eastern Avenue and Atlantic Boulevard where these traffic arteries come together and cross the freeway on a grade separation bridge. Union Pacific Railroad tracks are shown to the left. This traffic interchange system has become known as "The Mixmaster." Traffic congestion such as pictured here that occurs during peak hours will be relieved by construction of the Long Beach Freeway and road projects now under construction by the Los Angeles County Road Department.

Boulevard congested traffic conditions may be fully as important as that of the Long Beach Freeway when completed.

North of the Santa Ana Freeway additional capacity is still available on Rosemead Boulevard. Extension of Slauson Avenue across the Rio Hondo to join Rosemead Boulevard is scheduled for contract as a county FAS project in the 1953-1954 Fiscal Year, and plans have been submitted for review by the State. This project is a vital link with the industrial district and will utilize Route 168 as its main supply line. Completion of all of the above projects will greatly improve traffic service in the area.

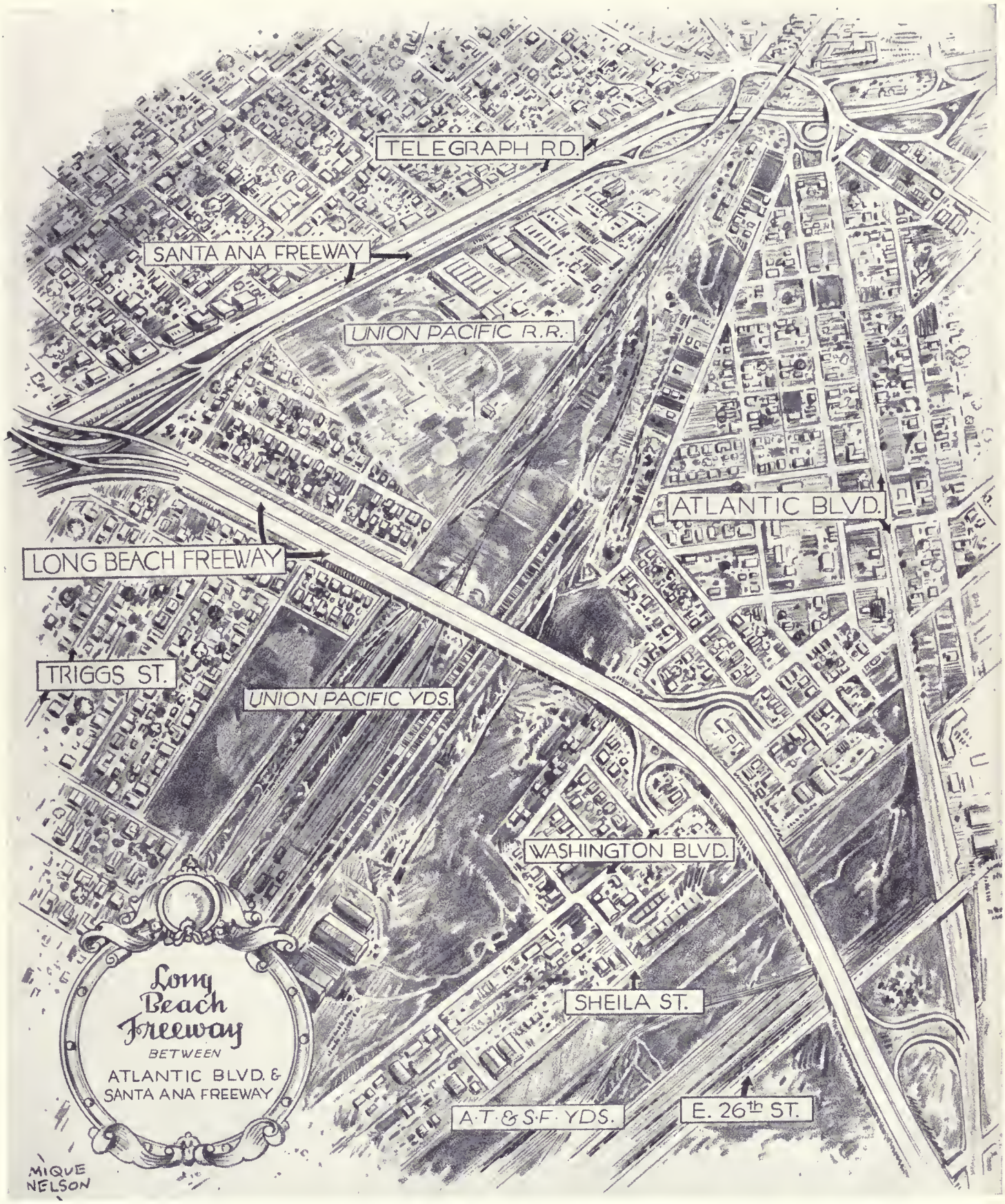
Future Construction

Preliminary action toward the construction of the northern extension of the Long Beach Freeway, previously known as the "Concord Freeway," from the Santa Ana Freeway to Huntington Drive in Los Angeles, was taken June 18th by the Highway Commission.

The commission declared its intention to consider the adoption of the new routing and declare it a freeway. The proposed extension is approximately 5.2 miles long and construction

Looking easterly showing completed bridge structure to carry the Long Beach Freeway over Del Amo Boulevard





Sketch map looking northerly showing portion of Long Beach Freeway as it will look crossing the freight classification yards of the Atchison, Topeka & Santa Fe Railway and the Union Pacific Railroad in the East Los Angeles area. In the background is shown the traffic interchange system between the Santa Ana Freeway, Atlantic Boulevard, Eastern Avenue and Telegraph Road that is now being called "The Mixmaster."



and right of way costs are estimated at nearly $20,000,000. Future construction, however, would be dependent on relative deficiencies of other portions of the State Highway System.

State Highway Engineer G. T. McCoy was requested by the commission to determine whether local authorities wish the commission to hold a public hearing before final action is taken to adopt the routing.

Major Relocation

The proposed routing involves a major relocation of the present route on Atlantic Boulevard. It provides for the extension of the Long Beach Freeway north from the Santa Ana Freeway, generally paralleling Eastern and Humphreys Avenues. It passes through the City Terrace area of Monterey Park in the Puente Hills and continues northward, roughly parallel to the Alhambra city limits, to connect with Huntington Drive near Lowell Avenue in Los Angeles.

Not including the 5.2 miles of the proposed northerly extension, the

Long Beach Freeway is 16.4 miles in length extending from Pacific Coast Highway (State Highway Route 60) in the City of Long Beach to the Santa Ana Freeway near the easterly city limits of Los Angeles. The contract for the southerly 2½ miles between Pacific Coast Highway and 223d Street was completed at a cost of $1,600,000 and opened to traffic during the early part of this year. Major freeway structures at Compton Creek and Del Amo Boulevard were completed and accepted by the State Director of Public Works on May 8, 1953. The piers for the Los Angeles River Bridge in Southgate were constructed by the U. S. Corps of Engineers in connection with the improvement of the river channel. Piers were financed by the Division of Highways at a cost of $167,000.



Airplane view looking northerly along completed Long Beach Freeway from Pacific Coast Highway in foreground to 223d Street in background. Beyond is shown construction now in progress along the Los Angeles River.

Four Going Contracts

At the present time work is in progress on four construction contracts. These contracts cover lighting and signs, grade separation bridges at Artesia Street, at Cota crossing of the Pacific Electric Railway between Dominguez Street and Del Amo Boulevard, and freeway construction between 223d Street and Atlantic Avenue in Compton. In addition, the State Division of Highways is financing the cost of constructing the Pacific Electric Railway grade separation structure in the City of Lynwood across the freeway, which project is being handled by the U. S. Corps of Engineers. The City of Long Beach and the State are jointly financing the cost of constructing a pumping plant at the junction of Long Beach Boulevard and the Long Beach Freeway. This project is being handled as a city contract. The total expenditure by State to date for rights of way and construction on the Long Beach Freeway is approximately $14,000,000.

Particular mention should be made of the construction work being carried out by the City of Long Beach, southerly of Pacific Coast Highway on the section of this freeway which is off the State Highway System. Early this year the city opened to eastbound and westbound traffic the Anaheim Street Bridge over the freeway that was included in the city's contract with Guy F. Atkinson. The City of Long Beach early in June of this year completed and opened a section of the city's portion of this freeway from Pacific Coast Highway extending under Anaheim Street to a temporary connection with Seventh Street and Pico Avenue. Southerly of Anaheim Street, the city is completing designs and will advertise and award city contracts in the near future for other grade separations with full traffic interchange facilities, and for bridges across the Los Angeles River. It is expected that this freeway, for which the City of Long Beach has

Looking easterly toward recently completed bridge to carry the Long Beach Freeway over Compton Creek





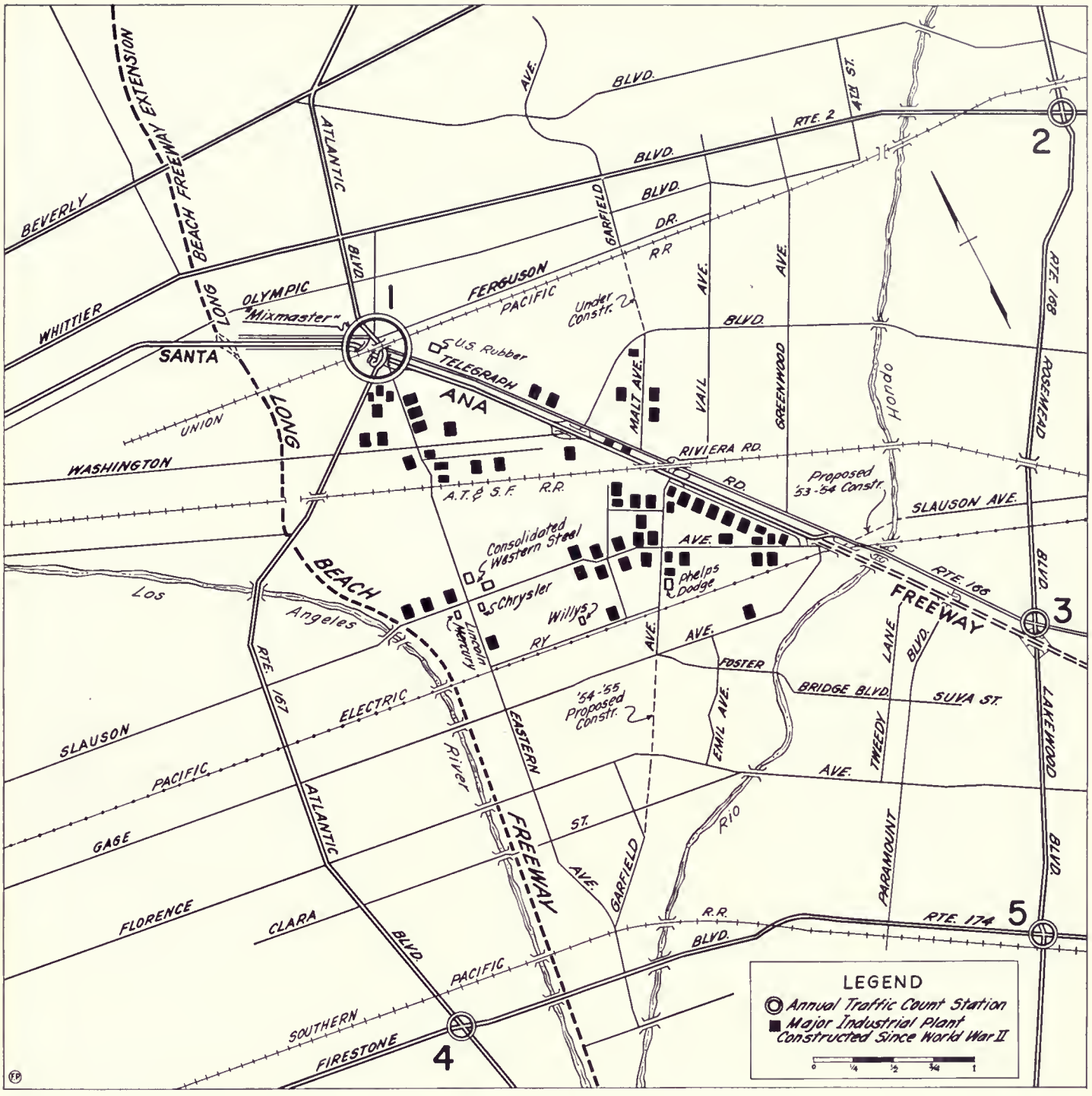
Looking southerly along Long Beach Freeway, showing Long Beach Boulevard Bridge in background



Looking northerly along Long Beach Freeway showing construction operations in vicinity of Long Beach Boulevard Bridge which was designed and built under supervision of the City of Long Beach



Looking southerly from Atlantic Avenue, along Long Beach Freeway showing construction operations in progress. Recently completed Artesio Street Bridge across freeway shown in background.



Vicinity map showing area easterly of Lang Beach Freeway where traffic study was recently completed. This map shaws location af annual traffic caunt statians and the majar industrial plants that have been canstructed in this area since Warld War II.

accepted responsibility for design, construction and financing, will be completed and opened to traffic within about three years' time. The total estimated costs of the city's portion of this freeway is in the neighborhood of $12,000,000, all of which is financed from other than state highway funds.

Freeway Between Compton and Long Beach

The completion of construction now under way on the four and one-half miles from 223d Street in Long Beach northerly to Atlantic Avenue in Compton, is anticipated early in 1955. When this is completed public traffic will have seven and one-half miles of continuous full freeway between Compton and Long Beach.

The Division of Highways is actively engaged in completing designs and right of way acquisition for the remaining nine miles between Atlantic Avenue in Compton and the north-

. . . Continued an page 38

State Fair

Again State Highways Will Bring Thousands to Capital City

All California highways again will lead to Sacramento when the 1953 edition of the California State Fair opens September 3d for an 11-day showing. With the famed exposition going into the climax of its ninety-ninth year, record crowds are expected.

Motorists, many of them bringing the entire family, are expected to converge on Sacramento from every county in the State, if past performances are any criterion.

From the smallest county—Alpine, nestling on the spine of the Sierra, and from San Bernardino, the largest—hopeful exhibitors and expectant visitors will fill the car with gasoline and oil and head for the 207-acre site of the fair in Sacramento.

In addition to the tremendous outpouring of agricultural and industrial wealth which will be represented at the fair, many counties are featuring their vacationland and sight-seeing attractions. Great variety in scenery, climate and terrain, plus the State's fine network of highways have made recreation and travel big business in California.

California's Magic

The theme of the 1953 State Fair is "California's Magic," which will be portrayed in scores of different ways. County exhibits, livestock shows, Hall of Flowers and commercial exhibits will carry the major load, but a full representation of the things which make California great will be on hand.

Two million dollars worth of purebred livestock, plus agricultural and industrial products representing the core of California's multi-billion dollar economy, beautiful flowers, works of art and crafts, racing, horse shows, music, showmanship and glamor all go into the pattern which emerges as the West's outstanding exposition.

Continuing in the path of constant improvement which the fair has followed throughout the years, this year's edition will offer $233,000 in premium money, more entries in various exhibits, more color, and the best entertainment available anywhere.



Typical scene on State Fair grounds

Many Counties to Exhibit

The California State Fair is a gigantic window display reflecting more than 100 years of progress and achievement by the Golden State. It is a miniature tour of the State with its fertile fields, productive orchards and vineyards, its bustling industrial areas, its ranges dotted with cattle and sheep, its bountiful natural resources, its fast growing cities, and its world famous recreational areas and scenic grandeur.

In the counties building alone representative samples of this vast wealth are collected in spectacular county exhibits. To date 36 counties have scheduled exhibits and nine more are making plans for exhibits.

Premiums which are offered by the fair to promote development of better agriculture, industry and homemaking, total $60,000 in the counties exhibit. Of this amount $18,600 is offered for the best feature exhibits and the remainder for specific products as part of the exhibits.

Livestock premiums this year will total $115,090, with $43,798 reserved for the junior division comprising Future Farmers of America and 4-H Club members. In addition to these awards by the fair, some 40 livestock associations, special organizations and institutions offer additional cash premiums, trophies, ribbons and prizes.

Horse Racing

Horse racing, another prime attraction at the fair, features racing daily except Sundays. Horsemen are offered $150,000 in purses. Enthusiastic support by the wagering public pushed nearly $4,000,000 through the mutuel windows last year for a new record and even that figure may be topped this year.

More than 200 industrial and commercial firms will exhibit their products in the commercial exhibits section this year, for which two new buildings are being erected.

For the gardening enthusiasts—California is full of them—the State Fair again will show one of the greatest floral and garden displays ever assembled in one place. The Hall of Flowers will become a setting of floral splendor with displays ranging from exotic tropical blooms to the spiny cacti of California's deserts.

For entertainment alone the fair offers just about everything. Top stars like Spike Jones and Phil Harris of stage, screen, radio and TV fame will star in the night shows. Jones and his troupe will play the first five days, while Harris will show the final six.

Sigurd Rascher, famed saxophonist, will give two free performances daily at the fair bandstand. Twenty bands, dozens of vaudeville acts and variety shows, dance revues and the Gayway add up to 11 days and nights of solid packed entertainment.

Admission to the grounds still is only 50 cents. Grandstand reserved seats for both horse racing and night shows are $1.50 and box seats $2.40. Reserved seats for the horse show are $1.20; whereas box seats are $1.80.


all HIGHWAYS LEAD TO THE STATE FAIR
24
STATE HIGHWAY
16
STATE HIGHWAY
20
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STATE HIGHWAY
99
40

Rural Road Inventory

By E. R. FOLEY
Supervising Highway Engineer

Joint County-State Comprehensive Studies

CALIFORNIA'S counties are cooperating in an inventory of all of the rural roads in the State. The Rural Road Inventory is a nation-wide program sponsored by the Bureau of Public Roads. The work is being done by the State-wide Highway Planning Survey of the Division of Highways.

The objective of the inventory is to traverse every rural road which is open to public travel and record or "log" mileage, physical aspects of the road, such as surface type, condition and width, plus the man-made improvements served by the roads. These improvements are referred to collectively, as "culture."

Upon completion of the inventory in any county, a report is prepared which includes tabulations of the field data, an analysis of the county's rural road system, and a series of maps.

Nation-wide Inventory

This nation-wide inventory of rural roads is a part of the planning program under federal aid to the states for highways.

The first such inventory was conducted and the resulting maps were prepared during 1936 and 1937. The maps are commonly referred to as Highway Planning Survey maps and are dated 1937. This initial inventory of rural roads provided factual data, much of which had not been compiled in any suitable form until that time.

As the postwar highway program developed, it was evident that the maps prepared in 1937 were inadequate, due to the tremendous growth during and after World War II. Many of the counties expressed a desire to avail themselves of the opportunity to use the facilities of the Highway Planning Survey in making a reinventory of their local roads. Therefore, on May 5, 1949, a procedure was set up for

ROAD INVENTORY

PARTY NUMBER 6 — Jerry Ball, COUNTY REPRESENTATIVE — CHIEF OF PARTY John Doe — RECORDER James Smith — DATE — POSTED NAME OR NUMBER OF ROAD: Thompson Road

COUNTY	MAP SHEET NUMBER	POINT OF BEGINNING LATITUDE	POINT OF BEGINNING LONGITUDE	DIRECTION	ROAD NUMBER
BUT	02B	394	215	B	0541A

NOTES	CONTROL	ROAD SYSTEM	RESERVATION	WIDTH ROADBED	WIDTH TRAVELWAY	SURFACE TYPE	SURFACE CONDITION	DIVIDED	SIDEWALKS LEFT	SIDEWALKS RIGHT	ALIGNMENT	GRADIENT	FEDERAL AID ROUTE NUMBER	INTERVENING DISTANCE	ODOMETER READING
END															
THOMPSON ROAD	1	4002	03	62	00	MG	01	1	1	1	1			00027	00027
Chico C. L. Sign															260
Smith St.															
Wolfe Cr. ◄ } (Br.	1	4002	03	62	00	MG	01	1	1	1	1			02702	248
16' Tim. ◄ } (Culv.															236
S.P.R.R.															225
137															210
Jog Right															
137 FA															210
DW DW CM															120
BE CH															114
33															110
BE															107
SC															97
DW BE															89
Sierra Nat'l. Forest Bdry.	1	4000	02	61	80	GF		00	1	2				11 103	03011 67008 1
433															75
DW															70
FA															46
DW															31
FA															13
BE															10
BUT-3-C	1	4022	03	22	00	GG	-0	02	2					01	02020 81000 0

STATE OF CALIFORNIA
STATE-WIDE HIGHWAY PLANNING SURVEY
IN COOPERATION WITH
BUREAU OF PUBLIC ROADS
U.S. DEPARTMENT OF COMMERCE

COUNTY			MAP SHEET NUMBER			POINT OF BEGINNING								DIRECTION	ROAD NUMBER					
						LATITUDE				LONGITUDE										
1	2	3	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
B	U	T	0	2	B	3	9	4	2	2	1	5	6	B	B	0	5	4	7	A

STRUCTURES

ROAD SYSTEM				ODOMETER				FUNCTION OF STRUCTURE		SUPER-STRUCTURE			SPANS				OVERALL LENGTH (FEET)					WIDTH				SUFFICIENCY	VERTICAL CLEARANCE				POSTING	CONDITION	DATE BUILT		FEDERAL AID ROUTE NUMBER					NOTES
										TYPE AND MATERIAL		MOVEABLE	NUMBER		LENGTH IN FEET							CURB TO CURB		RAIL TO RAIL															
24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	
4	0	0	2	0	2	4	8	1	1	T	5	0	0	3	0	1	5	0	0	0	4	7	2	0	2	5	2	0	0	0	0	F	4	2						Wolfe Creek

RAILROAD GRADE CROSSINGS

ROAD SYSTEM				ODOMETER				CALIFORNIA PUBLIC UTILITY COMMISSION NUMBER										NUMBER OF TRACKS		FEDERAL AID ROUTE NUMBER					NOTES
								RR CODE NO		LINE LETTER			MILEAGE					TYPE OF TRACK			MAIN	OTHER						
24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	
4	0	0	0	0	2	2	5	0	1	C	-	-	0	1	5	3	1	6	-	-	-	2	0						Southern Pacific R.R.

agreement between the counties and the State to accomplish this purpose.

The counties contribute financially at the rate of $2.50 per mile of maintained county road, and also furnish one man to aid the field party in the logging of field data. Formal agreements between the boards of supervisors of 25 of the counties and the State Division of Highways have now been executed. Seven final reports have been presented to the counties, and the inventory program in the remaining 18 counties under agreement is in various stages of completion.

The Field Inventory

The inventory procedure was set up primarily by the Bureau of Public Roads. The field party consists of a party chief, a recorder, and a county representative who is usually assigned from the county road commissioner's office. The presence of a representative of the county on the field party insures that the road commissioner's office is cognizant of the procedure used, and the experience gained is of direct value to the county and the man. It is his duty to act in liaison between the county and the State. He obtains all necessary information on the status of roads regarding jurisdiction. He is also helpful in obtaining subdivision maps in newly populated areas and in directing the party over the county's road system. All decisions as to whether or not a road is under county jurisdiction are made by county personnel alone.

An ordinary light sedan is used by the field party. It is equipped with an odometer capable of measuring to one one-thousandth of a mile—approximately five feet. Mileages are recorded to the nearest one one-hundredth of a mile. A special flashing red light, red flags, large rear-view mirrors, and an extra spare tire complete the special equipment used. The extra spare tire proved to be a necessity due to the conditions encountered on some of the so-called "traversable" roads. Needless to say, the field parties have had some fairly exciting trips into the wilds of various parts of California.

Road Logs

The road logs, as they are called, are recorded on forms especially adapted for tabulation of the data on the International Business Machines (IBM) equipment. *Figure 1* shows the front of this form, which is used for the road log. *Figure 2* shows the reverse side of the form, on which data on structures and railroad grade crossings are logged.

Among the items logged on the roads are:

1. Length
2. Width of roadbed and traveled way

3. Surface type and condition
4. Sidewalks
5. Alignment
6. Gradient

Roadside culture is also logged in rural areas, including:

1. Farms
2. Dwellings
3. Industrial plants
4. Business establishments
5. Transportation facilities
6. Schools
7. Churches
8. Recreational facilities

Details logged on structures of 20 feet in length and over include:

1. Function of structure
2. Type and material
3. Number of spans
4. Length of longest span
5. Over-all length
6. Width: Curb to curb and rail to rail
7. Sidewalks
8. Vertical clearance
9. Posting
10. Condition

Items logged on grade crossings include:

1. Railroad code number
2. Mileage
3. Type of track
4. Number of tracks

Additional data on train traffic and protective devices at the crossings are obtained from the Public Utilities Commission.

It is estimated that there are 100,000 miles of rural roads in the State. In San Bernardino County alone, 7,800 miles of roads were logged. The average rate is 25 miles per party per day.

Traffic Data

The Traffic Section of the Highway Planning Survey obtains traffic counts on the major county roads. These counts, correlated with regular state highway counts, are adjusted for weekly and seasonal factors and average daily traffic volumes are calculated for the county road system.

The traffic data along with the data obtained from the road inventory are punched on IBM cards for analysis. The information is then used in preparing tabulations and in mapping of the county.

Three Series of Maps

Three series of maps of each county are produced:

The general highway map shows culture served by the roads and has the surface type of the roads delineated by symbol in the road band. *Figure 3* shows Sheet No. 2 of San Diego County, as an example of this map.

The traffic map also shows the culture and has average daily traffic groupings delineated by symbol in the road band.

These two maps are required in the rural road inventory program of the Bureau of Public Roads.

The county road system map shows all county road names and numbers. State highways, county primary and county secondary roads are delineated on the map by symbol in the road band. Other local roads are shown by an open road band. *Figure 4* shows Sheet No. 2-J of San Diego County as an example of this map. By reference to *Figure 3*, the part of Sheet No. 2 can be located which is covered by Sheet 2-J at a larger scale.

The county road system map is developed for use in certification of maintained miles of county roads. Such certification is required by law to be made by the Director of Public Works to the Controller. The Collier-Burns Act distributes a portion of the gas tax to the counties on the basis of such mileages.

Base Map

The county maps are drawn at a base scale of 1 inch = 1 mile on 36 inch x 36 inch sheets. In areas where the congestion is too great to allow use of this scale, enlargements are shown in the margin or on extra sheets at a scale of 4 inches = 1 mile. Again, using San Bernardino County as an example, there are 30 sheets at 1 inch = 1 mile to cover the county. Twenty-five additional sheets are required to show the congested areas, for a total of 55 sheets in this county.

The map is plotted on the Lambert conformal conical projection from the logs, United States Geological Survey and Forest Service maps, county subdivision maps, aerial photographs, and other data. The road net, main hydrographic features, railroads, prominent ranges and mountain peaks, bridges, city limits, reservations, et cetera, are shown.

The Division of Highways has entered into cooperative agreements with the Production and Marketing Administration of the Department of Agriculture to obtain aerial photography of a large portion of the State. This photography is used in preparing the county maps, and it is also available for design studies in the planning of the expanding highway program.

The gyroscopic equipment of the highway planning survey has been used extensively where required to establish a basic net of roads where control is lacking. This was especially valuable in the desert area of San Bernardino County where many hundreds of miles of road were "gyro traversed" for road inventory purposes. The gyro equipment is thoroughly discussed in an article in the July-August, 1952, issue of *California Highways and Public Works*.

After a check of the pencil drawing, the base map is traced in ink on linen tracing cloth. This tracing is then used as the base from which to develop the three series of maps.

Developing the Three Series of Maps

Kodak Autopositive film is used to obtain reproducibles on which to delineate different features to complete the final maps.

First, a film is made of the base tracing. The county road names and numbers are added, and the symbols for county primary and county secondary roads, as well as state highways are delineated in the road band. This film then is the master for the county road system map.

Next, the culture symbols are added to the base tracing. "Stick-up" material is used in placing the culture on the base. The State Printing Plant prints the required symbols on special adhesive-backed sheets from a plate prepared by the drafting section. With the addition of the proper legend and title by "stick-up" methods, the base is ready for another autopositive film to be used in final preparation of the general highway map. To this film are added the symbols in the road bands denoting the various surface types of the roads, and it is then the master general highway map.

Finally, the General Highway title and legend are removed from the base tracing and necessary legend and title added for the traffic map. Another film



COUNTY ROAD SYSTEM SAN DIEGO COUNTY CALIFORNIA

is obtained from this base. Actual traffic counts and count stations are delineated thereon, as well as symbols in the road bands denoting various average daily traffic groupings. This results in the master for the traffic map.

Upon completion, each map is thoroughly checked by the checking section and necessary corrections are made. Prints are obtained for submission to the Bureau of Public Roads for final approval. Some corrections are required following this Bureau of Public Roads check, but the maps are now well standardized and such final corrections are few in number. A date of release is added and the mapping is complete.

Since the 36 inch x 36 inch sheets are rather unwieldy, except for office use, each series is photographically reduced to one-half scale by the State Printing Plant. These one-half scale maps, 18 inches x 18 inches in size, are proving very popular for use by various governmental agencies, private companies, and the general public.



GENERAL HIGHWAY MAP SAN DIEGO COUNTY CALIFORNIA

They are on sale by the Division of Highways at a price which covers cost of printing and handling.

Final Report

The final report on the rural road inventory in any county consists of a general discussion of the methods used in the field inventory, traffic counting, and mapping. In addition, an analysis is made of the various road systems by use of the IBM equipment. Two series of tables are offered to indicate the present status of the county's road system and of other roads which were logged. The first series of 13 tables deals with the roads. The second series of nine tables covers the structures of 20 feet and over in length.

Among the road tables presented are the following:

"Miles of Road Classified by Surface Type and Average Daily Traffic."

"Miles of Road Classified by Traveled Way Width and Average Daily Traffic."

"Miles of Road Classified as to Condition and Average Daily Traffic."

Among the structure tables are the following:

"Number of Structures Classified by Type and Material and Condition."

"Number of Structures Classified by Width and Average Daily Traffic."

"Number of Structures Classified by Condition and Average Daily Traffic."

"Number of Structures Classified by Posting and Condition."

A summary of the county's receipts and expenditures for road purposes over the past 15 years is also presented.

Field Notes

Accompanying the final report are copies of the field notes which are produced by use of the IBM equipment.

The master tabulation is designed to furnish all data obtained from the field inventory in a form convenient for ready reference with that for primary county roads, secondary county roads, other local roads, and state highways given in order. Average daily traffic and vehicle miles of traffic are included.

The structure tabulation contains all of the information logged in the field on structures. Average daily traffic is also shown where data are available.

The railroad grade crossing tabulation includes the field data logged as well as road and train traffic and protection at the crossings.

The County Road System Tabulation is designed to show the complete system of maintained county roads in a form applicable for use in certifying maintained miles under requirements of the Collier-Burns Act of 1947.

The original tabulation, reflecting the results of the rural road inventory, conforms with the county road system map produced at the same time. The law requires that any changes to a county's system of maintained roads be made by the Board of Supervisors in May of each year. When such changes are approved by the Division of Highways, a new tabulation can be turned out, the master maps changed, and the correct mileage of maintained county roads is then a matter of record annually.

Special Studies

With all data available on IBM cards, the Division of Highways is able to make very quickly any special study that the individual counties may request. For example, all roads could be listed in order of width or average daily traffic; structures in order of width or by condition. If a county road department wished to study its primary and secondary systems, those primary roads carrying very light traffic and those secondary roads carrying very heavy traffic can be listed as well as other critical features as desired. This service is available to the counties on request.

Uses

The county maps, tabulations and report have many uses. The need for adequate records of mileages of county roads maintained has been mentioned. Many of the smaller county road departments have never had an adequate amount of personnel to undertake a systematic inventory of their roads. The Collier-Burns Act of 1947 requires that each county employ a road commissioner. Since its enactment many new men have taken over this position in the various counties. In many cases it was necessary that they set up a complete new system of records. With limited funds and lack of trained personnel, this job is far from complete. Therefore, there is practically unanimous approval of the road inventory program by the road commissioners.

Maps Are Valuable

In some of the counties in which the inventory has been completed, members of the boards of supervisors have stated that they find the maps and tabulations extremely valuable at board meetings. Quick reference can be made to specific points on road matters brought before them by the taxpayers as individuals and in groups.

Humboldt County requested the inventory with the express intention of using the data in preparation of a sufficiency rating system upon which future allocations of road improvement funds are to be based. They are now engaged in preparing such a rating system with advice from the Institute of Transportation and Traffic Engineering of the University of California.

It should be noted that the Humboldt County Supervisors were so interested in expediting the inventory program that the county undertook the making of their own traffic counts. The supervisors themselves helped in this work.

Used in Planning

The planning commissions in several counties have expressed great interest in the data as compiled and are using the resulting maps and tabulations in their planning programs.

Kern County has prepared special maps of each road foreman's district from the inventory data for use of their maintenance forces.

In the summer of 1952, the County Supervisors Association requested all counties to submit a road deficiency report, with specific data required on deficiencies and cost of improvement. Those counties with the inventory data already available were able to prepare their reports to the association with a minimum of effort and a consequent saving in cost. The reports of these counties were also among the best presented.

Maps in Wide Use

At the state level, the maps are in wide use, not only in the various sections of the Division of Highways, but in other departments, including the Public Utilities Commission, Beaches and Parks, and Highway Patrol.

The Bureau of Public Roads makes use of the inventory data on a nationwide scale in preparing material for presentation to committees of Congress regarding new appropriations for federal aid and the like. The federal aid secondary system is delineated on the maps and studies of the over-all system and individual projects to be undertaken in the federal aid secondary program are aided by use of the maps.

Other federal mapping agencies are furnished with prints of the county maps for their special uses.

. . . Continued on page 60



Artist Van der Goes, Bridge Department, uses aerial photograph taken by Merritt R. Nickerson to indicate proposed relocation of Feather River Highway. White line on right indicates present Feather River Highway, which will have to be relocated. White line on left shows approximate relocation of highway. White line in center foreground indicates proposed realignment of Western Pacific Railroad line.

Continued from page 2 . . .

and the proposed Buena Vista Hills Pumping Plant near Taft is being mapped, and the canal located on the ground, by a survey party.

Revised Estimates of Cost

Revised cost estimates of the Oroville Dam, Oroville Power Plant, Afterbay Dam, Afterbay Power Plant, Switchyards, Transmission Lines and Bethany Substation, based on redesigns of these features are nearing completion. The preparation of new drawings, based on the redesigns, to be used for the amended exhibits to be submitted to the Federal Power Commission in connection with an application for license now on file with that agency, is in progress.

A contract for drilling core holes by diamond drill at the Oroville dam site has been completed with seven holes drilled on each abutment for a total length of 1,627 feet. Two exploratory tunnels, one on each abutment, have been excavated to a total length of 1,800 feet. The drilling of five diamond drill core holes at the site of the proposed combination railroad and highway bridge crossing of the West Branch of Feather River has been completed with a total length of hole of



Van der Goes and Nickerson cooperate again. The artist uses oeriol photograph upon which to place his conception of whot the Oroville Dam and spillway and reservoir will look like when completed.

345 feet. A transparent plastic model of the Oroville dam site based on data obtained by core drilling and tunnelling, and the detailed topographic survey of the site, is being constructed for further study of foundation conditions.

Design of Canals

Design of the canals and structures of the San Joaquin Valley and Southern California units is in progress and a detailed layout of the canal is completed from intake at Italian Slough to Los Banos. A tentative layout of the canal south of Quail Lake has been made for about 63 miles of line and typical structures designed. Appraisal of properties for the San Joaquin Valley unit is in progress.

Consulting engineers working with the Byron-Jackson Pump Company have completed alternative plans and and layouts for the pumping plants at Wheeler Ridge and Pastoria Creek and layouts for the other plants. The work is now sufficiently advanced to permit detailing of the equipment and the writing of specifications.

Work is being continued in San Bernardino on possible holdover storage sites and main lateral routes in the area south of the Tehachapi Mountains.

Cost Index

California Highway Construction Costs Almost Stationary in Second Quarter

By RICHARD H. WILSON, Assistant State Highway Engineer
H. C. McCARTY, Office Engineer
JOHN D. GALLAGHER, Assistant Office Engineer

CONSTRUCTION costs on state highway contracts awarded during the second quarter of 1953 were only 0.4 percent lower than those of the first quarter of 1953 as reflected by the California Highway Construction Cost Index.

The index for the second quarter of the year was 217.5 (1940=100), only eight-tenths of an index point below the 218.3 for the first quarter. This second quarter index figure of 217.5 is 27.9 index points, or 11.4 percent under the 245.4 for the fourth quarter of 1951, which was the quarter of highest costs as indicated by the index. It also is 57.5 points, or 35.9 percent over the 160.0 of the first quarter of 1950, which was the low dip in prices prior to the beginning of the Korean War.

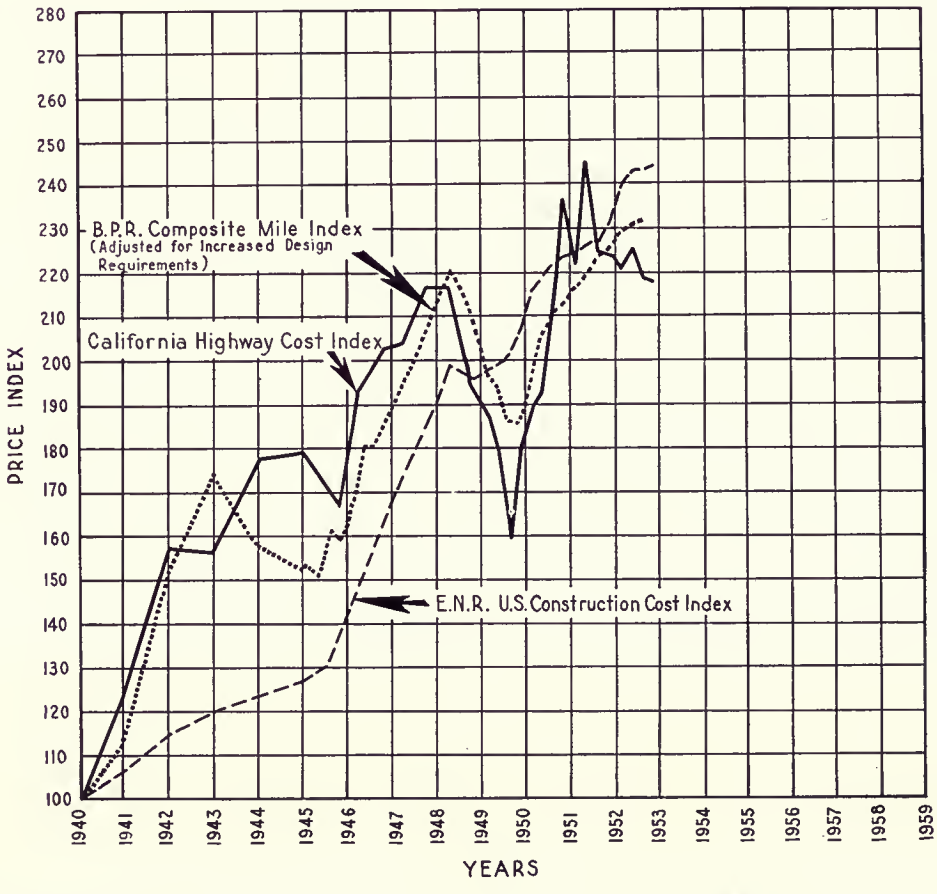
The following is a tabulation of the California Highway Construction Cost Index by years and quarters since 1940.

Year	Cost Index
1940	100.0
1941	125.0
1942	157.5
1943	156.4
1944	177.8
1945	179.5
1946	179.7
1947	203.3
1948	216.6
1949	190.7
1950 (1st quarter)	160.0
1950 (2d quarter)	180.0
1950 (3d quarter)	189.2
1950 (4th quarter)	194.8
1951 (1st quarter)	215.4
1951 (2d quarter)	238.3
1951 (3d quarter)	221.9
1951 (4th quarter)	245.4
1952 (1st quarter)	224.8
1952 (2d quarter)	224.4
1952 (3d quarter)	221.2
1952 (4th quarter)	226.2
1953 (1st quarter)	218.3
1953 (2d quarter)	217.5

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

PRICE INDEX CONSTRUCTION COSTS

1940 = 100



While the index dropped four-tenths of 1 percent during the second quarter of 1953 this is not necessarily to be considered an indication of a leveling off of construction costs as average contract prices on four of the eight construction items used in computing the index showed increases during the period.

Roadway excavation, which had shown such a marked decline during the first quarter of 1953, was up 11 percent, rising from $0.45 to $0.50 per cubic yard. Average prices of plant-mixed surfacing, asphalt concrete pavement and Portland cement concrete pavement all increased; the P. M. S. from $5.27 to $5.38 per ton, the A. C. pavement from $4.46 to $4.59 per ton, and the P. C. C. pavement from $12.47 to $13.06 per cubic yard.

Number of Bidders Prequalified to Bid On State Highways

The following data show number of contractors qualified to bid state highway projects as of July 1, 1953. Based on their maximum ratings, these 691 contractors are grouped as follows:

$10,000,000 and over	— 32
5,000,000 to 10,000,000	— 66
2,500,000 to 5,000,000	—117
1,500,000 to 2,500,000	—184
1,000,000 to 1,500,000	—233
500,000 to 1,000,000	—337
250,000 to 500,000	—481
100,000 to 250,000	—575
50,000 to 100,000	—607
up to 50,000	—691

The combined bidding capacity on June 30, 1953, of these 691 contractors was $1,345,632,100, or in round figures $1,350,000,000.

In arriving at this combined bidding capacity figure all ratings in excess of $20,000,000 are entered at the $20,000,000 figure.

Last year at this time there were 611 prequalified contractors with a combined bidding capacity of $1,118,337,500, using the $20,000,000 cut-off point.

The four items for which average contract prices declined were: untreated rock base which dropped from $2.48 to $2.07 per ton, structure concrete from $53.19 to $52.68 per cubic yard, bar reinforcing steel from $0.098 to $0.091 per pound and structural steel from $0.150 to $0.132 per pound. In this group the 17 percent drop is the average contract price of untreated rock base, the 12 percent drop in structural steel, and the 7 percent drop in bar reinforcing steel were the major influences causing the slight decline of 0.4 percent in the over-all index.

That the declining influence of steel will not continue is a certainty as a rise in basic prices for the next quarter has been announced, and the current negotiations between labor and management for another round of wage increases in practically all branches of the construction industry can indicate

AVERAGE CONTRACT PRICES

	Roadway excavation, per cu. yd.	Crusher run base, per ton	Plant-mix surfacing, per ton	Asphalt concrete pavement, per ton	PCC pavement, per cu. yd.	PCC structures, per cu. yd.	Bar reinforcing steel, per lb.	Structural steel, per lb.
1940	$0.22	$1.54	$2.19	$2.97	$7.68	$18.33	$0.040	$0.083
1941	0.26	2.31	2.84	3.18	7.54	23.31	0.053	0.107
1942	0.35	2.81	4.02	4.16	9.62	29.48	0.073	0.103
1943	0.42	2.26	3.71	4.76	11.48	31.76	0.059	0.080
1944	0.50	2.45	4.10	4.50	10.46	31.99	0.054	0.132
1945	0.51	2.42	4.20	4.88	10.90	37.20	0.059	0.102
1946	0.41	2.45	4.00	4.68	9.48	37.38	0.060	0.099
1947	0.46	2.42	4.32	5.38	12.38	48.44	0.080	0.138
1948	0.55	2.43	4.30	5.38	13.04	49.86	0.092	0.126
1949	0.49	2.67	4.67	4.64	12.28	48.67	0.096	0.117
1st quarter 1950	0.34	2.22	3.65	3.74	....	40.15	0.077	0.081
2d quarter 1950	0.40	2.13	4.48	3.74	10.86	43.03	0.080	0.105
3d quarter 1950	0.41	2.32	4.25	5.50	10.91	44.34	0.093	0.131
4th quarter 1950	0.42	2.81	4.64	4.61	12.55	43.18	0.098	0.120
1st quarter 1951	0.45	3.07	4.06	5.22	11.71	46.38	0.103	0.206
2d quarter 1951	0.63	3.88	4.56	4.63	12.93	51.50	0.105	0.166
3d quarter 1951	0.56	2.88	4.59	3.90	12.41	46.14	0.107	0.165
4th quarter 1951	0.66	2.91	5.66	4.89	12.71	49.38	0.105	0.169
1st quarter 1952	0.56	3.25	4.88	4.77	14.25	47.46	0.094	0.152
2d quarter 1952	0.53	3.19	5.29	4.13	14.20	49.12	0.091	0.143
3d quarter 1952	0.55	2.61	5.49	4.60	12.80	48.21	0.094	0.132
4th quarter 1952	0.66	2.68	4.97	....	12.53	48.45	0.094	0.128
1st quarter 1953	0.45	2.48*	5.27	4.46	12.47	53.19	0.098	0.150
2d quarter 1953	0.50	2.07	5.38	4.59	13.06	52.68	0.091	0.132

* Untreated rock base substituted for crusher run base at this point.

NUMBER AND SIZE OF PROJECTS, TOTAL BID VALUE AND AVERAGE NUMER OF BIDDERS

(January 1, 1953, to June 30, 1953)

Project volume	Up to $50,000	$50,000 to 100,000	$100,000 to 250,000	$250,000 to 500,000	$500,000 to 1,000,000	Over $1,000,000	All projects
Road projects:							
No. of projects	74	16	39	16	7	7	159
Total value (bid items)	$1,608,046	$1,216,955	$6,105,860	$5,384,564	$4,754,912	$9,288,699	$28,359,036
Avg. no. bidders	5.1	5.8	5.8	6.4	10.0	7.7	5.8
Structure projects:							
No. of projects	24	9	6	2	3	1	45
Total value (bid items)	$517,582	$661,397	$987,498	$630,150	$1,999,819	$1,140,222	$5,936,668
Avg. no. bidders	6.8	8.3	10.5	17.0	9.3	16.0	8.4
Combination:							
No. of projects						4	4
Total value (bid items)	....	....	....	....	....	$10,959,600	$10,959,600
Avg. no. bidders						7.8	7.8
Summary:							
No. of projects	98	25	45	18	10	12	208
Total value (bid items)	$2,125,628	$1,878,352	$7,093,358	$6,014,714	$6,754,731	$21,388,520	$45,255,304
Avg. no. bidders	5.5	6.7	6.4	7.6	9.8	8.4	6.4

Total Average Bidders by Months

	Jan.	Feb.	March	April	May	June
1953	5.5	6.1	7.5	6.4	5.9	6.0
1952	7.6	6.4	6.9	6.0	4.5	4.8

NUMBER AND SIZE OF PROJECTS, TOTAL BID VALUES AND AVERAGE NUMBER OF BIDDERS

(July 1, 1952, to June 30, 1953)

Project volume	Up to $50,000	$50,000 to 100,000	$100,000 to 250,000	$250,000 to 500,000	$500,000 to 1,000,000	Over $1,000,000	All projects
Road projects:							
No. of projects	149	42	67	30	14	8	310
Total value (bid items)	$3,266,574	$3,017,829	$10,575,448	$9,953,453	$9,566,240	$11,208,491	$47,588,035
Avg. no. bidders	4.5	5.0	5.9	5.8	8.2	7.4	5.2
Structure projects:							
No. of projects	40	20	10	6	5	3	84
Total value (bid items)	$896,140	$1,443,987	$1,714,427	$2,097,372	$3,233,306	$5,242,057	$14,627,289
Avg. no. bidders	4.8	6.9	9.2	9.0	9.4	9.3	7.2
Combination:							
No. of projects					2	8	10
Total value (bid items)	---	---	---	---	$1,917,715	$19,972,108	$21,889,823
Avg. no. bidders					3.0	8.0	7.0
Summary:							
No. of projects	189	62	77	36	21	19	404
Total value (bid items)	$4,162,714	$4,461,816	$12,289,875	$12,050,825	$14,717,261	$36,422,656	$84,105,147
Avg. no. bidders	4.7	5.6	6.3	6.8	9.0	7.9	5.7

Total Average Bidders by Months

	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	Year
1952-53	4.3	4.3	5.9	5.1	5.9	4.8	5.5	6.1	7.5	6.4	5.9	6.0	5.7
1951-52	4.3	4.0	4.6	4.4	8.0	7.3	7.6	6.4	6.9	6.0	4.5	4.8	5.3

only additional rises in construction costs.

While in the previous quarter both the Engineering News-Record Construction Cost Index and the U. S. Bureau of Public Roads Composite Mile Index showed signs of hesitancy and leveling off from their steady and continuous rise, they again indicate an upward trend. The Engineering News-Record Index for the second quarter of 1953 is 244.1 (1940=100) which is 1.4 index points or 0.6 percent above the 242.7 for the first quarter and the U. S. Bureau of Public Roads Composite Mile Index (adjusted for increased design requirements) for the first quarter of 1953 was 231.7 (1940=100) which is 1.5 index points or 0.7 percent above the 230.2 of the fourth quarter of 1952.

Price indexes on the over-all economy of the Country as well as reports of many economic analysts claim at least a leveling off if not a decline of prices in general. Nevertheless, consideration of bid prices received on state highway projects in California and the continued demand for wage increases present no firm indication of any decline in highway construction costs.

Analysis of the highway construction cost situation in California indicates that several current factors tend to counteract rises in contract bid prices.

Competition between bidders on state highway work is extremely strong.

One factor which is affecting bidding on heavy construction in California is the governmental freeze placed on the extensive construction of projects for the Air Force, the Army and the Navy for which nearly six billion dollars was voted two years ago, of which $467,000,000 was to have been spent in California. Some California contractors who were low bidders on large contracts for such federal work find themselves waiting while the whole program is reviewed and revamped. These contractors must have going work and they bid to get it.

There are a large number of construction contractors operating in California (691 are prequalified to bid on state highway work), many of whom must regularly meet large equipment obligations, and in addition must have continuing work to hold

. . . Continued on page 47

Freeway Project Through San Luis Obispo Progresses

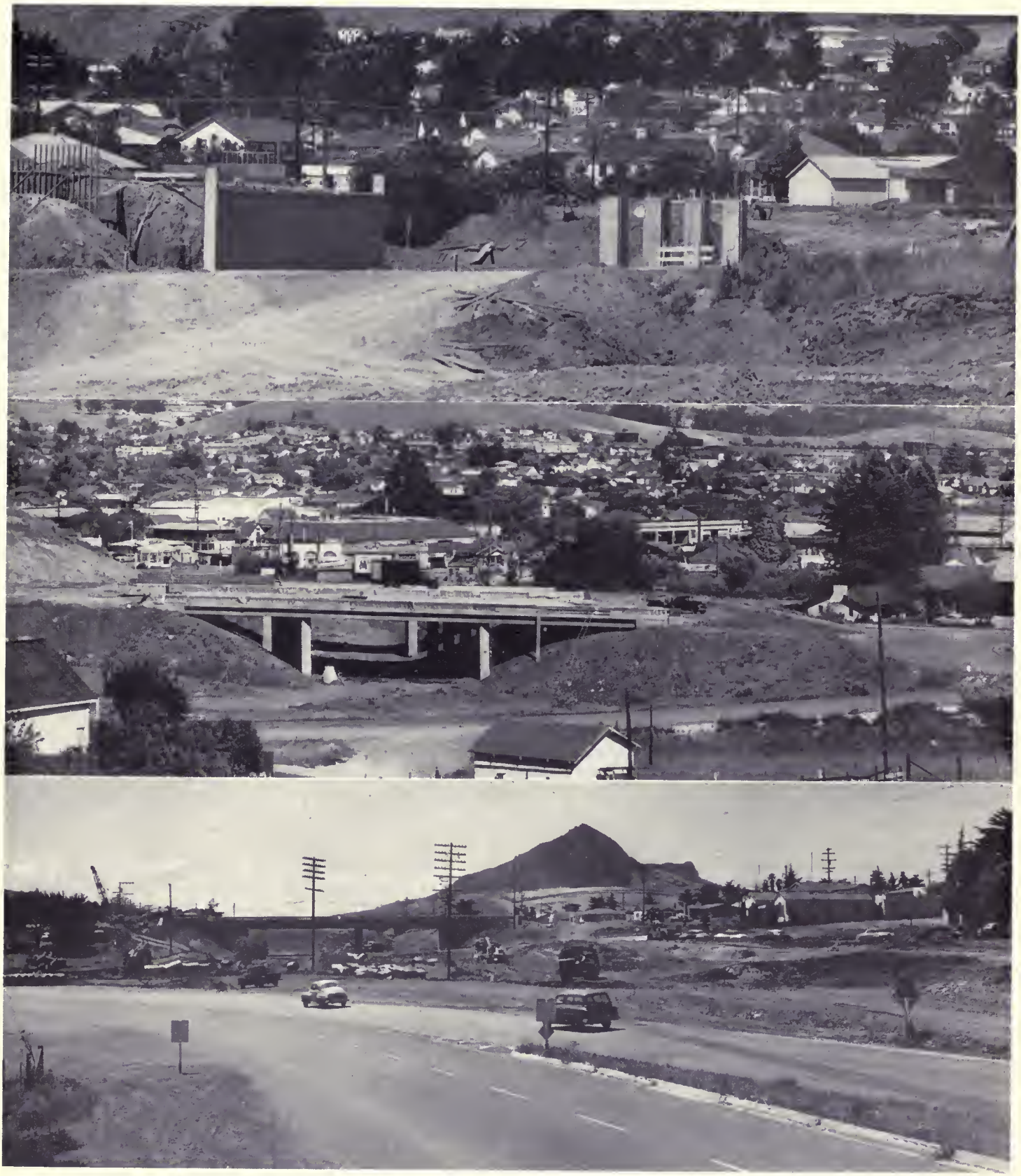
Photo opposite →

THE CITY of San Luis Obispo, halfway between San Francisco and Los Angeles, has rapidly undergone a major physical change in that the development of U. S. 101 through the city is now well past the halfway mark with regard to completion.

The freeway routing through the city, for the most part, follows a depressed area. At the present time a major drainage structure which carries Stenner Creek under the freeway in a reinforced concrete box culvert has been completed as have the grade separation structures at Marsh, Chorro, Grand and Buena Vista Streets. Work on the Santa Rosa (Highway 1) Street crossing is well under way as is the Southern Pacific Railroad undercrossing. It is anticipated the Santa Rosa Street structure will be completed on August 25, 1953, and the railroad undercrossing on approximately the same date. Immediately upon completion of the railroad undercrossing the shoofly located immediately north of the railroad will be removed and work will be started on the Ida Street crossing.

Grading work is now practically completed and the placing of imported base material has been started. It is estimated all structures, grading and base work will be completed early this fall and that the final project for paving will be let to contract soon thereafter. All work being completed as scheduled it is anticipated the freeway will be opened to traffic early in 1955.

The C. B. Tuttle Company of Long Beach built the Marsh Street, Chorro Street and Stenner Creek structures; the Thomas Construction Company of Fresno built the Buena Vista and Grand Avenue structures; the Granite Construction Company of Watsonville is building the Santa Rosa and Ida Street separations and the railroad undercrossing; and the Madonna Construction Company of San Luis Obispo has the grading contract. R. M. Herbert and W. A. Curtis represented the Bridge Department on the structures and W. W. Evans is the resident engineer on the grading project for the district.



UPPER—Partially constructed Santa Rasa Street (Route 56) Crossing of San Luis Obispo Bypass. CENTER—Completed structures for March Street Grade Separation and connections at sautherly end of San Luis Obispo. LOWER—Completed Buena Vista Crassing af freeway at northerly end of Son Luis Obispa.

Long Beach Freeway

Continued from page 23 . . .

erly terminus of this freeway at the junction of the Santa Ana Freeway and Olympic Boulevard. On this section, construction contracts will be advertised and awarded as fast as funds are made available.

On May 28, 1953, bids were opened in the Los Angeles office of the Division of Highways for the construction of a structural steel and reinforced concrete overhead for the Long Beach Freeway over the tracks of the Union Pacific Railroad between Leonis Street and Dunham Street. J. A. Thompson and Son, Contractors, of Inglewood, California, submitted the low bid of $1,147,221.50.

Structural Steel Overhead

On June 25, 1953, bids were opened in the Los Angeles office of the division for the construction of a reinforced concrete and structural steel overhead to carry the Long Beach Freeway over the freight classification yard of the Atchison, Topeka & Santa Fe Railway. The low bid was submitted by B. J. Ukropina, T. P. Polich, Steve Kral and John R. Ukropina of San Gabriel in the amount of $1,174,577.10. The general location of these two railroad grade separation bridges over freight classification yards is shown on the accompanying "bird's-eye" drawing by Mique Nelson of the District VII staff.

The Long Beach Freeway between 223d Street and Olympic Boulevard will be constructed initially as a six-lane divided freeway with provision being made at some future date to widen this freeway to an ultimate width of eight lanes northerly of its junction with the Sepulveda and Terminal Island Freeways. Southerly from the junction, the ultimate width of the Long Beach Freeway is six lanes and is so being constructed.

In the construction of this freeway the Division of Highways is fortunate in having had the fullest possible cooperation from the various cities, the Los Angeles County Regional Planning Commission, Flood Control District and Road Department and the U. S. Corps of Engineers. It is in no small measure due to these other governmental agencies that the Long Beach Freeway is now so well along toward completion.

In Memoriam

RALPH E. C. DELANEY

Funeral services for Ralph E. C. Delaney, Assistant Highway Engineer for the State Division of Highways, District VII, were conducted on July 3, 1953, at Forest Lawn in Glendale in the Little Church of the Flowers.

Ralph was born on September 28, 1904, in Denver, Colorado. He graduated from the East Denver High School in 1922 and was employed from that date until 1926 by a construction firm in Denver. In 1927 he came to California and worked for the Los Angeles County Surveyor and the Los Angeles County Flood Control District until 1936. He then accepted appointment with the State Division of Highways in District V at San Luis Obispo and later transferred to District VII at Los Angeles where he was employed until the time of his death.

In District VI Ralph worked for nine years with the Survey Department as Instrumentman and Chief of Party. During that time he carried out many of the first freeway surveys in the Los Angeles area. For the last four years he was employed by the District Construction Department as Assistant Resident Engineer and Resident Engineer on many different types of highway contracts. His last assignment was on the Harbor Freeway construction between the Four-level Traffic Interchange Structure and Olympic Boulevard. In downtown Los Angeles, Ralph's background of wide experience on construction made him a very valuable man on complicated freeway projects. He was particularly adept at working out detailed arrangements which came up when freeway construction interfered with existing facilities. His services with the Division of Highways will be greatly missed.

Ralph was a member of the San Marino Masonic Blue Lodge and was very active with the De Molay group, having received the Legion of Honor award from that organization. He is survived by his wife, Mrs. Theresa Delaney, and two sons, Robert, age 23, who is a cadet in the Air Force at Moultree, Georgia; and Richard, age 20, who is with the 35th Infantry Regiment in Korea.

Salinas Freeway Rapidly Nearing Completion Date

Photo opposite ⟶

RAPIDLY nearing completion on Highway 101 through the City of Salinas are the first two units of the Salinas Freeway, which will eventually provide for freeway development over a length of approximately 10 miles, passing through the fringe area and the city itself. The development will connect on the south with the recently completed expressway just south of Spence Underpass and will be on the east side of the railroad for its entire length. In general, it passes to the east of the industrial development along the railroad and Abbott Street, through the easterly portion of Salinas and the western portion of Alisal, terminating for the present with a traffic interchange at the intersection with North Market Street near the Santa Lucia Inn. Future plans provide for the freeway to be developed on the westerly side of the existing routing of U. S. 101 between the North Main Street crossing and Santa Rita.

The two projects now under construction involve approximately 2.2 miles of grading, four reinforced concrete overcrossings (North Main Street, Sherwood Drive, Alisal Street and Market Street); two double 12-foot box culverts, and 8 x 10 x 268-foot box culvert, together with numerous drainage structures. Ramps and approaches being constructed in connection with the major overcrossings are to be paved with plant-mixed surfacing on cement-treated base, also short sections of city streets connected with the various crossings. Due to an unfavorable drainage condition and to facilitate settlement and consolidation of basement soils, it was necessary to construct numerous vertical sand drains and to supercharge major fills, particularly in the vicinity of the Market Street Overcrossing. Excellent results have been obtained therefrom.

Keeble and Caputo of San Jose are the contractors on both projects. J. M. Sturgeon is the Resident Engineer for the district, and the Bridge Department Representatives are Guy Mancarti and A. E. Hoerchner.



UPPER—North Main Street Overpass construction looking south. CENTER—Market Street Crossing, showing construction work, looking north. LOWER—Sherwood Drive Overcrossing, looking west.

National Safety Awards

Continued from page 3 . . .

all ratings are based both on the maintained miles of highway and on annual vehicle miles of travel in each state. Under this rating, the advantage rests with the smaller, highly urbanized states where the many lengths of rural highways between cities are necessarily highly developed from the traffic control standpoint. Since mountain and desert roads comprise a high percentage of California's highway system, the first place award to this State is indeed a remarkable achievement, with full credit going to the California Division of Highways and its traffic department.

Highway Patrol Recognized

The award for first place in traffic law enforcement was given for the work of the highway patrol. Presentation was by John D. Holstrom, Berkeley Chief of Police, Fifth Vice President of the International Association of Chiefs of Police, the organization which judged the enforcement phases of the inventory.

Joseph E. Havenner, Los Angeles, presented the first place award for traffic engineering on behalf of the Institute of Traffic Engineering. The institute judged this portion of the inventory which covered activities of the Division of Highways, Department of Public Works.

The drivers license award for outstanding achievement was presented by Paul F. Hill of Chicago, senior field director for the National Safety Council. The award was in recognition of work done by the Division of Drivers Licenses, Department of Motor Vehicles.

Present at the presentation ceremonies in the Governor's office were: George T. McCoy, State Highway Engineer; George M. Webb, State Traffic Engineer; Rodney C. Richardson, Assistant to the Director of Public Works; Milo L. Hewitt, Supervising Inspector, California Highway Patrol; A. H. Henderson, Director of Motor Vehicles, and Tom Bright, Deputy Director of Motor Vehicles.

Governor Warren, after accepting the awards, passed each one along to the state department involved.

In Memoriam

EMIL A. PENROSE

Emil A. Penrose, Highway Superintendent of the Santa Monica area of District VII, passed away of a heart attack at his home in Santa Monica on the evening of June 30, 1953.

Gus, as he was affectionately known by his many friends, was born in La Grange, Texas, on August 1, 1899. He became Highway Superintendent of the Santa Monica area in September of 1941 and served in that capacity until his untimely passing at the age of 53. His sincerity, devotion and ability were long considered an example of all that a husband, father, friend and public servant should be.

Gus joined the U. S. Marine Corps in 1918 and served until 1920. From 1920 to 1929 he gained much valuable experience as a carpenter, miner and contractor. He entered state employment in February, 1929, in District IX, beginning his career with the Division of Highways Maintenance Department as a skilled laborer. He transferred to District VII in 1933 as a maintenance foreman. His reputation as one of the best highway superintendents in the State was well earned, fully deserved and widely recognized. He will be greatly missed by all who knew and worked with him.

He is survived by his widow, Mrs. Alice I. Penrose; a daughter, Mrs. Harold L. R. Smith; a son, Kenneth L. Penrose, and three grandsons.

Highway Engineers Win Essay Awards

Division of Highways' employees John W. McDonald and Scott H. Lathrop submitted winning essays in the recent nation-wide Better Highways Awards Contest conducted by General Motors.

McDonald, a resident engineer in District V, received the top California award of $1,500 for his paper on "How to Plan and Pay for the Safe and Adequate Highways We Need." Lathrop, an engineer in the Sacramento Headquarters Office, received $500 for one of the two honorable mention awards given in California.

The awards were presented on June 29th by General Motors officials at a dinner meeting of the General Motors Club in San Francisco.

Rock Slide Closes Scenic Tahoe Road

Photo opposite ⟶

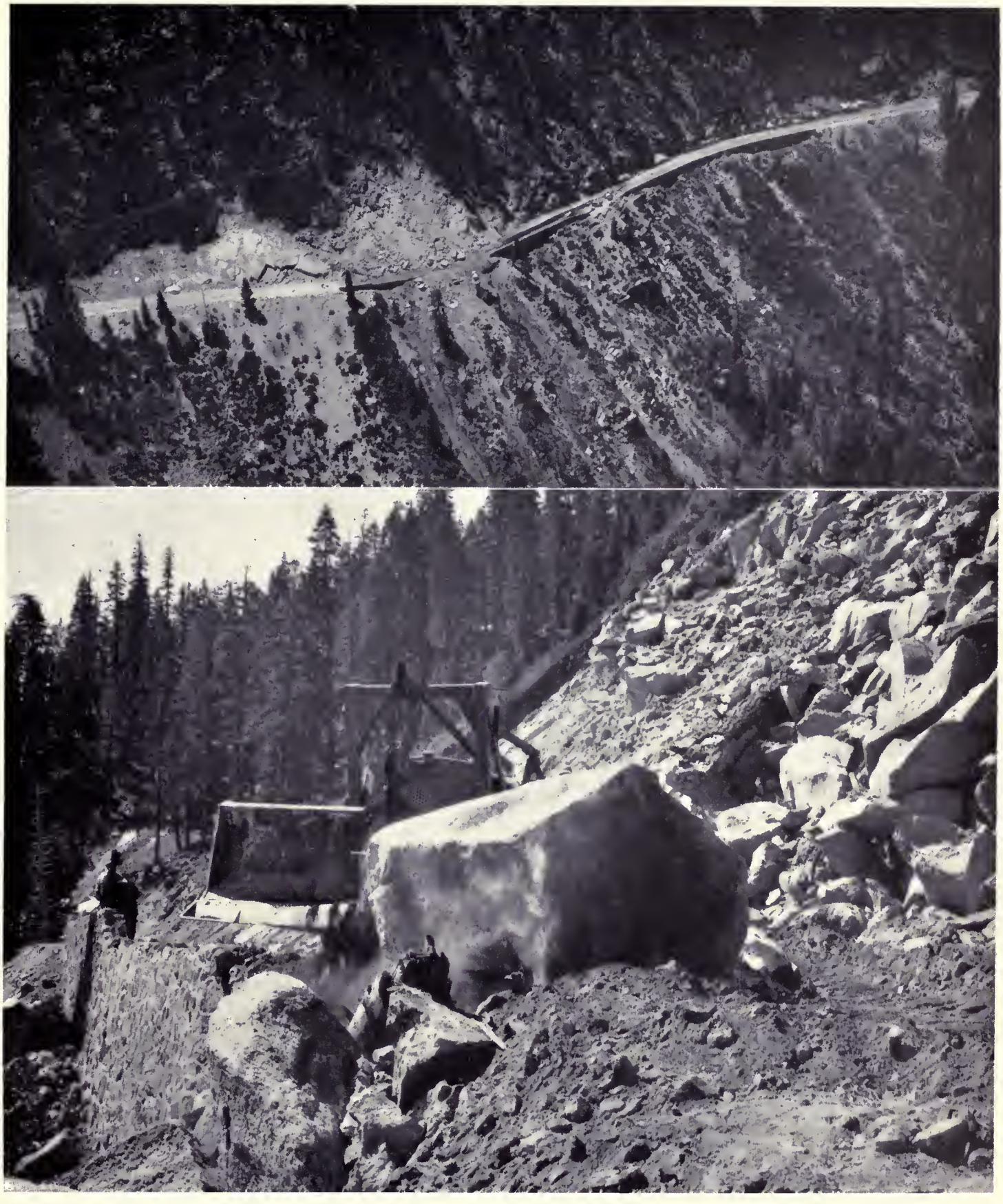
A ROCK SLIDE of unusual proportions for high altitude Sierra roads closed scenic State Sign Route 89 near Eagle Creek on the west side of Lake Tahoe on Sunday, May 24, 1953. The site of the slide was at a point high above Emerald Bay on a portion of the road which is buried deep in snow during the winter months.

The closure resulting from the fall of thousands of yards of massive boulders and trees followed closely the removal of the last remnants of drifts and snowslides and the opening of the section to summer travel. One-way traffic was restored through the slide area the following day; however, additional movement of the rock mass forced the closing of the road again on Tuesday, May 26, 1953.

As a preliminary investigation disclosed that a large crack had opened in the mountain side above the slide face, clearing of the road could not be started until a geological investigation of the entire area had been made and the effect of removing the slide material determined.

Large boulders, some rolling from points 100 feet or more above the road, made the slide clearance work extremely hazardous and required the scaling of the entire slope of all loose fragments. Heavy bulldozer equipment was used to remove the massive rocks from the road surface.

The road was reopened to one-way traffic under flag control during daylight hours on June 19th. Traffic was carried past the slide under control during the night of June 25th, and unrestricted movement was restored on June 26th.



UPPER—Aerial view af slide area near Emerald Bay. LOWER—Bulldazer clearing rack slide fram Sign Route 89.

Eastshore Freeway

Traffic Bottleneck in San Lorenzo and Hayward Broken

By WILLIAM TRAVIS, Senior Highway Engineer

One of the more serious traffic bottlenecks in the metropolitan San Francisco Bay area was obviated on Friday, June 5, 1953, with the official opening to traffic of a newly constructed portion of the Eastshore Freeway. The new unit extends from Lewelling Boulevard in San Lorenzo to Jackson Street in Hayward, a distance of 3.9 miles. and brings the length of Eastshore Freeway completed at present to a total of 14.7 continuous miles.

Dedicatory ceremonies and an inspection tour were sponsored by numerous local civic organizations under the leadership of the Alameda County Highway Advisory Committee. Ribbon cutting rites were held at the Jackson Street terminus of the freeway and again at the entrance of the newly completed A Street Interchange, which will serve San Lorenzo.

Ceremonies Held

Following these ceremonies, at an informal reception in San Lorenzo, state highway representatives and the contractors met with county officials and representatives of many local civic organizations which have been instrumental in furthering the freeway program in the East Bay. Harry Bartell, chairman of the Alameda County Highway Advisory Committee, presided. Speakers on the program included State Highway Engineer G. T. McCoy, B. W. Booker, Assistant State Highway Engineer in charge of District IV, and Highway Commissioner H. Stephen Chase of Sacramento.

This newly opened portion of the Eastshore Freeway provides the highest type of traffic service for the communities which it traverses, and will be of greatest value in relieving heavy through traffic on local roads.

Four-lane Divided Highway

The new unit is a four-lane divided facility with provision for ultimate expansion to six lanes. Interchanges at Winton Street, A Street and Hesperian Boulevard will assure the orderly flow of traffic to and from the freeway. Freeway overcrossings for local traffic have been placed at Hathaway Avenue and Paseo Grande, and an undercrossing for pedestrian use has been constructed at Sunset Boulevard.



Eastshore Freeway looking south toward San Lorenzo. Washington Avenue interchange in foreground.

The dedicated section, costing $3,938,000 including rights of way, was completed by Frederickson & Watson Construction Company and M & K Corporation, joint venture contractors, with commendable speed, less than 20 months having elapsed between the start of work and opening ceremonies.

Another Freeway Project

Another Eastshore Freeway project now under construction between Fallon and Market Streets in Oakland, scheduled for completion at the end of the year, will eliminate the present conflict between Eastshore Freeway traffic and Posey Tube traffic. Plans are rapidly being furthered for additional units of the freeway within the City of Oakland, which units, when completed, will provide a full freeway facility from the San Francisco-Oakland Bay Bridge to Hayward.



LEFT—Looking narth along Eastshore Freeway toward San Larenzo; Winton Avenue claverleaf in foreground, A Street diamand type interchange in the middle. RIGHT—Eastshore Freeway looking narth toward San Leandro; structures visible include bridges over San Larenza Creek in foreground, fallawed by Hesperian Boulevard Undercrassing, Lewelling Baulevard Undercrossing, and Washingtan Avenue Overcrassing.

BEN ALI-ROSEVILLE FREEWAY ON U. S. 40 UNDER WAY

AUTHORIZATION to advertise for bids on the second unit of the Ben Ali-Roseville Freeway on U. S. 40-99E has been given to the Division of Highways by State Director of Public Works Frank B. Durkee.

Bids were opened on July 29th in Sacramento for construction of seven reinforced concrete bridges along a 7.4-mile portion of the future freeway between Ben Ali in Sacramento County and the Placer County line.

Work began a few weeks ago on construction of six structures and grading of the freeway roadbed for the Roseville bypass from the Placer County line to one-half mile east of Roseville, a distance of 3.5 miles.

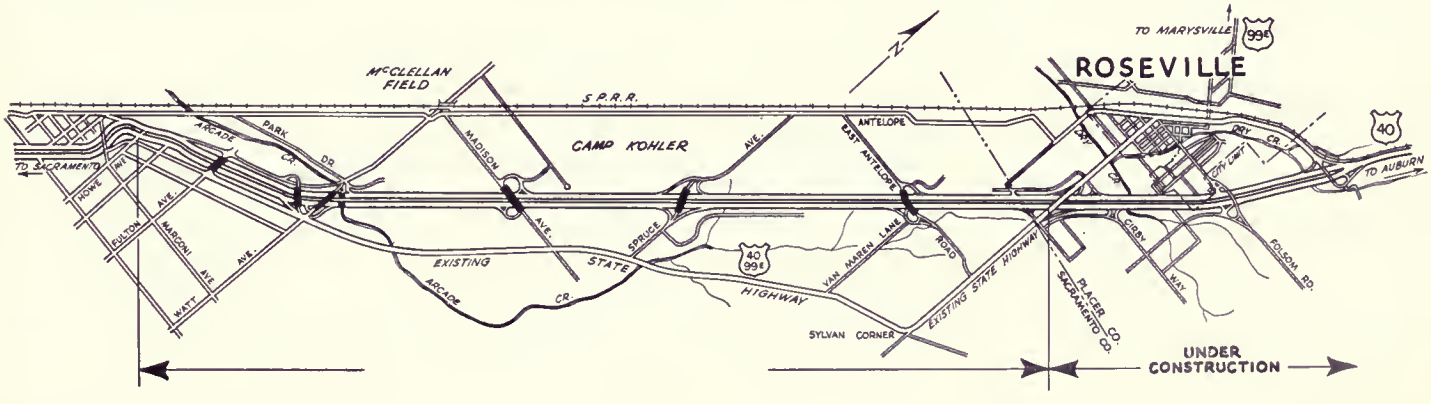
Allocation of $2,200,000

The State Highway Budget for 1953-54 contains an allocation of $2,200,000 for both jobs. The estimated cost of the Placer County portion of the work, now in progress, is $1,345,000, leaving approximately $855,000 allocated for the seven structures to be built in Sacramento County.

Both contracts are scheduled for completion in the summer or early fall of 1954.

Grading of the Sacramento County portion of the freeway and paving of the entire project will be placed under contract as soon as progress on the structures will permit.

. . . Continued on page 5B



Early Days

First Highway Commission Gives Way to Present-day Agency

By R. C. (CASS) KENNEDY, Secretary, California Highway Commission

(Continued from last issue)

At the meeting of the Highway Commission on March 19, 1919, the minutes show that the commission had received a letter from the Automobile Club of Southern California requesting permission to erect an ornamental arch of "WELCOME" over the state highway alongside a certain camping site at Cajon Pass in San Bernardino County. But it was voted that the granting of such permission would establish an annoying precedent and that the same be denied. In other words, the commission was even then keeping signs off the state highways.

On May 29th, the seminar, or conference, with all division engineers, was held. Various aspects of highway construction, such as drainage, thickness of concrete, width of pavement, and everything else pertaining to it, were discussed, and all the engineers have the benefit of their experience to the commission.

Mr. Emmett Phillips, commissioner from Sacramento, passed away on June 18, 1919. At the meeting of June 26, 1919, George C. Mansfield of Oroville presented his credentials as the appointee of the Governor and was seated. At this same meeting, the secretary read a letter from Dr. C. R. Blake, County Health Officer of Contra Costa County, complaining that certain cloth signs that he had placed on the state highway in Contra Costa County had been removed by Division of Highways employees. These signs were warning against dumping garbage and refuse on the state highway. Naturally, the doctor was complaining about such action of the employees of the State Highway Commission. The commission decided that such signs, authorized by boards of health, do not violate the intent of the law and the commission's regulations concerning signs on the state highway. The commission voted that the Highway Engineer be requested to notify the various division engineers to permit such signs to remain when placed on the state highway.

Publicity Needed

At the August 5th meeting the commissioners decided that they should have more publicity regarding what they were doing. They instructed the secretary to prepare a publicity letter for the press following each meeting of the commission. But before this letter was released, it should be submitted back to the commission for its approval.

Also, at the August meeting, a group from the State Forestry Board and people interested in preserving the redwoods, along with the State Superintendent of Banks, and two or three other people, met with the commission to discuss the best procedure to pursue to preserve the redwoods along the state highway in Mendocino, Humboldt, and Del Norte Counties. After a rather long discussion, the minutes show that the members of the State Forestry Board, the State Highway Commission, and other interested parties would make a journey to Eureka, to arrive at Eureka on Saturday, August 30, 1919. They would then hold a conference with the persons who were then engaged in cutting timber along the state highway, and then would formulate a definite policy as to the course to pursue.

Measuring Tires

At the meeting of November 6, 1919, a letter from T. J. Tehaney, Superintendent, State Motor Vehicle Department, was read. This letter concerned the matter of weight limitation per inch of tire width as referred to in Section 15 of the Motor Vehicle Act. On recommendation of the Highway Engineer it was voted to adopt the idea. Then the minutes go on to detail how to measure the width of tires and how to weigh the trucks with front wheels on the scale, and then the rear wheels on the scale, and then all upon the scale.

One of the first commission actions in 1920 was denial of a permit to the Touring Bureau of the California State Automobile Association which had requested a permit to send a Fageol truck loaded with batteries to Los Angeles from San Francisco. The truck was to be driven at a speed in excess of 15 miles per hour. It was voted that the Automobile Association be informed that the California Highway Commission did not have the authority to increase the rates of speed defined by the State Motor Vehicle Act. In that day and age (1920) the trucks all had solid rubber tires on them and the speed limit had been set for them on the highways at 15 miles. Also, it was noted that Division Engineer Caruthers was granted a leave of absence for one year so that he might assume the duties of engineer of Sacramento County. The county had sold some bonds, the proceeds of which were to be used on the construction of roads, streets, etc.

Leave for Caruthers

Caruthers was given a leave of absence. G. R. Winslow, who was first assistant highway engineer under Mr. Fletcher, was appointed to fill the job as division engineer.

The commission went into the pest control business on January 22, 1920. There is a paragraph in the minutes stating that it was the opinion of the commission that the State should cooperate in the eradication of ground squirrels on state highway rights of way wherever the adjoining property owners were doing their part by killing these rodents. The highway engineer was authorized to adopt such measures as might be necessary to render such assistance on behalf of the State.

On January 28, 1920, the commission had received an application from Alexander Burness, who was agent for Balfour, Guthrie & Company of Brentwood. He wanted to use four trailer

wagons attached to a 45-horsepower Holt Caterpillar tractor for hauling sand and gravel on the highway and across the iron bridge near Brentwod. This, the commission denied, being of the opinion that the use of more than two trailers was not for the best interests of the public.

Secretary Ellis Resigns

On February 26th there is an application from the Automatic Clock Company of Lodi, California. It wanted to erect glass signs, 6 feet by 2½ feet, which would be automatically lighted. These signs would contain a road guide and avertising matter. The company wanted to erect these signs at all curves, railroad crossings and crossroads along the State Highway System in California. The commission denied this, holding that it was contrary to policy.

At the March 23d meeting in 1920, W. R. Ellis resigned as secretary. The resignation was to become effective on March 31st, with a leave of absence in the meantime at his option. Ellis had been secretary of the commission since the beginning on August 9, 1911, until March 31, 1920.

At this meeting, C. C. Carleton was appointed acting secretary and he was to be that in addition to his duties as attorney.

At the April 13th meeting, the commission authorized W. G. Hunter, an assistant highway engineer, to go to Washington, D. C., and possibly to certain War Department bases in the east. He was to go there for the purpose of selecting equipment and supplies offered to the commission by the U. S. Bureau of Public Roads.

Nothing is said in the minutes as to how many trucks were going to be allotted to the commission by the U. S. Bureau of Public Roads. These trucks were surplus military equipment. But at the April 23d meeting, the commission instructed the Highway Engineer to set aside one hundred motor trucks from the allotment for rental to state agencies for use on public highways, and that from the one hundred trucks so set aside, one truck be reserved for each county in the State.

Overloads on Highways

At the June meeting, because of the apparent need to reduce state highway construction, owing to the difficulty of selling highway bonds, the Highway Engineer was directed to discontinue all location surveys as soon as practicable, and to dismiss all survey parties that were not needed for the work of the construction already in program in progress. To further retrench, the commission voted that a number of day labor authorizations should be discontinued immediately.

People who were overloading on highways were in for a bad time, for at the October 5th meeting of the commission, the Highway Engineer was instructed to purchase six loadometers. He was directed further to have a suitable truck, equipped with four of these loadometers, and to assign two employees to operate the truck in cooperation with one or more officers from the State Motor Vehicle Department. The commission wanted to start out as soon as possible on a systematic weighing of trucks, which appeared to be operating illegally, and it wanted this to be done in all parts of the State.

Also, at this same meeting the specifications for concrete bases were changed. Bases had been four inches up to this time, and were increased to five inches. The vote was that on all going contracts, and on all future contracts, the base should be increased to five inches.

Directional Signs

At the meeting on February 9, 1921, the commission voted that the Highway Engineer should make a study and a report on a plan for the establishment of a system of warning and directional signs on state highways. He was also to give an estimate of the cost of such a system. He was supposed to include in this report such information as he could gather on what had been done in other states and in foreign countries, and also any of the codes adopted by the International Association of Road Congresses, and the American Association of State Highway Officials.

At numerous places in the minutes of 1921 are notations of adverse votes regarding requests to hang signs across the road. Chambers of Commerce of different towns all wanted either to hang a canvas sign or make a permanent sign at each end of their town that was traversed by a state highway, so that when a motorist got to this sign he would know where he was. But the commission ruled against every one of them as they came up. It even refused permission for the Six-Minute Ferry, which used to run across Carquinez Straits, to put up signs indicating the way to the ferry.

In the minutes of March 3, 1921, I ran across the name of Henry J. Kaiser of Seattle, Washington, who was bidding on a road job in Santa Barbara County. As I continued through the minutes of 1921 I discovered that later on Mr. Kaiser had changed his address to Oakland, California. I think probably that everyone who is reading this knows who Henry J. Kaiser is.

On May 18, 1921, John F. Galvin of Richmond, California, was appointed secretary and disbursing officer of the commission. He succeeded Ellis.

On May 18th the commission voted that the Highway Engineer be directed to issue a general order to all his divisions to the effect that only such warning devices as were the property of the State be installed at grade crossings and dangerous places on state highways.

Public Works Department Formed

The Legislature in January, 1921, made some changes in the setup of the Highway Commission and other departments in the State. It passed a law forming the Department of Public Works, very similar to what it is today. The Highway Engineer was made the Executive Officer of the commission to work directly under the commission.

On September 21st the commission split the State into three inspection districts—one, District A, with headquarters in Alameda; two, District B, with headquarters in Sacramento; and three, District C, with headquarters in Los Angeles. Three general inspectors—one for each district—were appointed. Evidently these men were general inspectors of all the work done under contract or day labor.

The minutes of the October 11th meeting make notice of letters received from boards of supervisors of the following counties: San Diego, Placer, Amador, Ventura, San Bernardino, Orange, Marin, and from the Highway Commission of the City of San Diego, and from the Tahoe-Ukiah Highway

. . . Continued on page 55

New Span

San Leandro Bay Bridge Is Opened to Traffic

On July 1, traffic began using the new San Leandro Bay Bridge connecting Alameda with Bay Farm Island. Work started on the new bridge on April 18, 1951.

The old bridge was first built in 1881 and spanned the Estuary at Webster Street. In 1898 it was moved to its present location. Much deterioration has taken place on the old span over the years. For several years it has been posted for reduced speed and weight limits.

Future developments af San Leandro Bay by the City of Oakland have been taken into consideration in the design of the new bridge. All the piers adjacent to the channel have been made deep enough to allow for the dredging of a deepwater channel to an elevation of minus 35 feet. At such time as the water traffic becomes sufficiently heavy provision has been made so that a second bascule leaf may be erected to double the available channel width and increase the present 92-foot width to a channel width of 200 feet between fenders.

Large Cofferdam

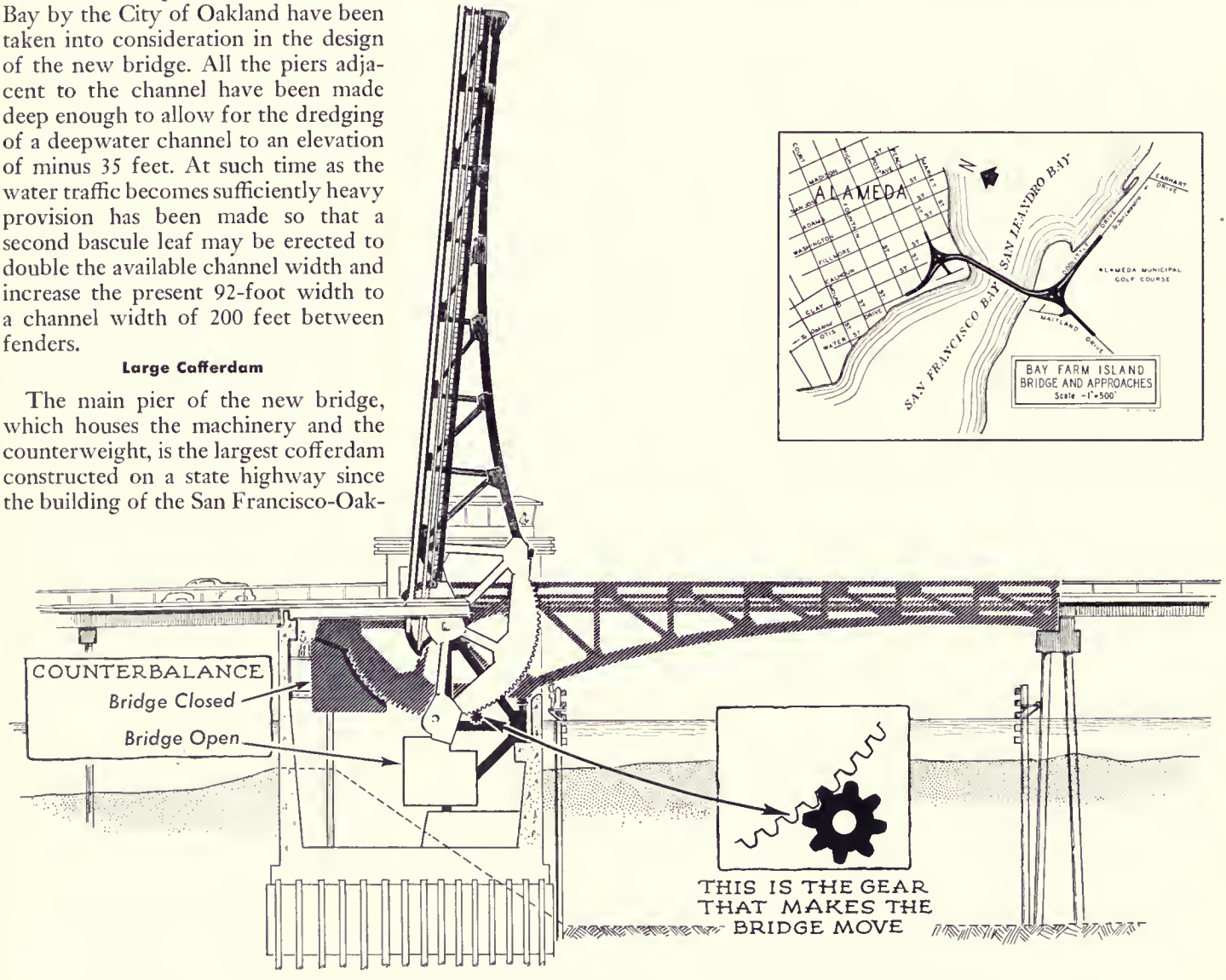
The main pier of the new bridge, which houses the machinery and the counterweight, is the largest cofferdam constructed on a state highway since the building of the San Francisco-Oakland Bay Bridge. The pier is 55 feet wide, 90 feet long and is 73 feet high. It rests on 369 timber piles. At such time as the channel may be deepened provision has been made for attaching a heavy duty fender around the pier for protection from collision with large vessels.

The bascule span is 125 feet long and is counterbalanced by a counterweight weighing 1,100 tons. The design is such that the counterweight is suspended below the roadway and sinks into a well in the pier when the bridge is raised.

Two 50-horsepower motors will open the bridge to its full angle of opening in two and one quarter minutes. All of the operating machinery for the lift span is enclosed within the main pier.

Maximum Protection for Traffic

A complete interlocking electrical system is provided to insure maximum protection to vehicular and pedestrian



Artist's sketch showing location of San Leandro Bay Bridge and mechanical method of its operation

traffic. In raising the bridge the operations must be followed in the prescribed sequence by the operator. It is so designed that it is impossible to open the span until all the protective devices, including traffic gates on the north end and the positive barriers which raise out of the deck on the south end, are in place.

Duncanson-Harrelson Co. and Stolte, Inc., were the contractors for the bridge proper. Fredrickson & Watson Construction Co. was the contractor for the approaches. The design and construction of the bridge was carried out by the California Division of Highways Bridge Department under the direction of F. W. Panhorst, Assistant State Highway Engineer—Bridges. The resident engineer for the Bridge Department was John E. Burke.

Right of way, moving utilities and clearance came to $156,000. Approaches cost $338,000. The bridge, including engineering and design, cost $1,850,000. The total cost of the project was $2,344,000.

Cost Index

Continued from poge 36 . . .

their construction organizations intact, with a result that they bid low to get the jobs.

It is the belief of this department that such costs will continue upward, possibly at a decelerated rate, but still upward.

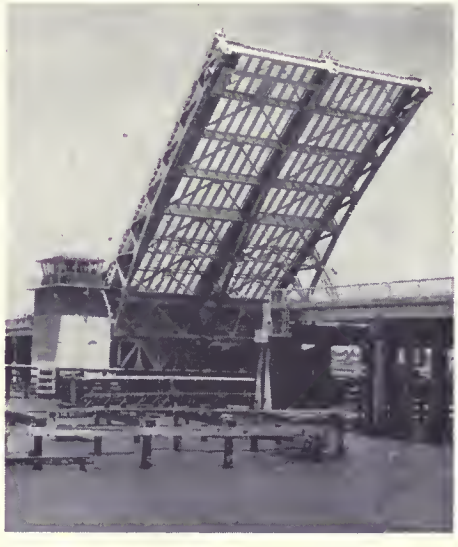
On the accompanying chart are plotted for comparative purposes the Engineering News-Record Construction Cost Index, the U. S. Bureau of Public Roads Composite Mile Index (adjusted for increased design standards) and the California Highway Construction Cost Index, all to the base of 1940=100.

Accompanying tabulations show: (1) the average unit prices by years and quarters for the eight basic highway construction items on which the California index is based; (2) the average number of bidders on various sized contracts for the first six months of 1953 and for the fiscal year from July 1, 1952, to June 30, 1953; and (3) the number of bidders prequalified to bid on state highway construction on June 30, 1953, grouped to the several brackets of bidding capacity.



Aerial photograph of San Leandro Bay Bridge opened on July 1

This photograph shows span being opened during dedication ceremony



FROM TURKEY

California Highways and Public Works
Sacramento, California, U. S. A.

GENTLEMEN: Traffic Safety Section of the Turkish Ministry of Public Work will greatly appreciate if you will be kind enough to mail us a copy of "January-February" and "March-April" 1953 issues of the *California Highways and Public Works* magazine and from then on enter our section as a regular subscriber of the magazine.

We are sure that the magazine will be very useful in our daily studies and we thank you in advance.

Yours sincerely,

SEDAT MENGILIBORU
Chief, Traffic Safety Section
Construction and Maintenance Division
Ankara, Turkey

Retirements *from* Service

Frank E. Burnside

Frank E. Burnside, retired General Superintendent of Shops for the Equipment Department of the Division of Highways, was honored recently at a gathering of his former associates at Sacramento, who presented him with a beautiful television set and a leather-bound "Memory Book" containing the signatures of his many friends in the Division of Highways.



FRANK E. BURNSIDE

Burnside retired on April 1st of this year after more than 33 years of service. His record of state employment began on October 15, 1919, shortly after his discharge from the United States Navy, when he "hired-out" as repair shop foreman for Division (now District) III. Three years later he was appointed general foreman, and the following year, superintendent of the newly organized Division of Highways Equipment Department.

Schooling in Sacramento

He received his early schooling in the public schools of Sacramento, where he completed high school. In later years, by diligent home study, correspondence, and university extension courses, he so advanced his education that he was able to qualify for certification as a registered mechanical engineer.

His first position after leaving school was with the Southern Pacific Company in 1905 as clerk. The salary of 15 cents per hour seems infinitesimal by today's standards, yet it was, apparently, the prevailing wage at that time. In 1906, Burnside began his four-year apprenticeship to the machinist trade. Following the completion of that apprenticeship, his interest turned from railroads to the new field of automobiles, which were then only beginning to crowd the horse out of the livery stable. With but few interruptions, Burnside's career was from then on connected with matters automotive.

In Fire Department

It is interesting to note that he was the first driver of the first piece of

. . . Continued on page 58

Frank Burnside in 1904 Buick being handed traffic citation. (The editor suspects this picture was posed in fun.)



Fred R. Belknap

Fred R. Belknap, 70, Division of Highways Engineer in the District VIII Office at San Bernardino, retired from state service on May 5th. Belknap, who has led many survey parties on highway projects throughout the southern part of the State, came to work with the division in 1921 as an instrument man with District VII in Los Angeles. He transferred in 1928 to the San Bernardino district, where he remained until his retirement.



FRED R. BELKNAP

Belknap was born in 1883 on the Tulare Indian Reservation. He received his engineering training from the Throop Institute of Technology at Pasadena, graduating in 1904. Throop Institute was the forerunner of the present-day California Institute of Technology.

Belknap had a varied career before becoming permanently associated with the Division of Highways 32 years ago.

In 1906 he was employed on the Owens River Aqueduct. In 1910 he worked for a short time as a transitman on the Alaska Northern Railroad at Seward, Alaska, leaving his job to spend the next two years prospecting for gold.

From 1913 to 1917 he was employed by the Imperial Water Company at Holtville, California, and later by the San Diego and Arizona Railroad.

During World War I Belknap served with the U. S. Army Engineers in France, returning in 1919 to take a job with the Los Angeles County Flood Control.

Belknap and his wife reside at 2244 Serrano Road in San Bernardino.

Luke D. Packard

Luke D. Packard, Senior Highway Engineer in charge of the Drafting Section of the Highway Planning Survey, retired on June 30th after 28 years' service with the Division of Highways.

Packard came to work for the division in 1920 as an assistant resident engineer on a construction project along U. S. 99E in Tehama County.



LUKE D. PACKARD

From 1921 to 1924 he was stationed in District VII at Los Angeles where he served as resident engineer on several bridge jobs throughout the southern part of the State. In 1924 he transferred to Headquarters Bridge Department in Sacramento where he first was Assistant Bridge Engineer and later Construction Engineer.

From 1928 to 1932 Packard left state service to engage in private contracting work, planning and supervising the construction of many highway, bridge, water system, and building projects.

Veteran of Two Wars

He returned to the Division of Highways in 1932, first serving as resident engineer on the Kings River Canyon Highway, and later joining the Planning Survey at headquarters.

Packard is a veteran of both World Wars. From 1917 to 1919, he served as air cadet and later second lieutenant with what was then known as the Aviation Section of the Signal Corps, and which eventually developed into the U. S. Air Force. From 1940 to 1947 he served as major, and later as lieutenant colonel with the U. S. Air Force and was stationed for some time in Alaska and the Aleutian Islands.

Packard was born at Granville Summit, Pennsylvania, in 1889 and attended school at Tacoma, Washington.

His engineering career began in 1906 when he took a job as a chainman on a locating party for the Green River Water Supply System which serves the City of Tacoma.

. . . Continued on page 51

Harry H. Wildy

A retirement party was tendered by friends and associates on Monday, June 1, to Harry Wildy, one of the few remaining colorful early day surveyors. His practices established surveying procedures that are used extensively in District VII highway work today. The loss of his services will be keenly felt by all of his co-workers.



HARRY H. WILDY

Born in Yazoo City, Mississippi. Following his early migration westward in 1913 from work with Stone and Webster in Boston, Massachusetts, he began his long career as a surveyor with Koebig and Koebig in Los Angeles. In March, 1914, he began a year and a half's work with the Santa Fe Railroad. He started his 39-year career with the State on September 15, 1914.

During the colorful days when practically all of the district business correspondence was written in longhand, Harry had many varied experiences, stories of which never fail to excite the listener's imagination. Of course Harry's good friends accuse him of exercising his own imagination when relating them but for the most part, he has old-time friends to verify even the most doubtful.

During Harry Wildy's heyday there were many occasions when teams and wagons stuck in the mud, rough winters with snow in the mountains and dry windy summers on hot sandy deserts and the often recurring plague of late paychecks or long delayed expense checks. Even in those days, salary increases were obviously a problem, as witness a letter by District Engineer Patch to Headquarters office on June 21, 1918:

"As mentioned herein, private corporations in this locality are giving a general increase to their employees at a higher percentage increase than recommended above, and some of our best men have been offered and accepted better salaries for doing work similar to what they have been doing in this division."

Harry Wildy's record is one to be envied by the old-timers and to be emulated by young engineers. Reports on his performance are generously sprinkled with such remarks as:

"One of the best party chiefs we have had"; "Thoroughly dependable in every respect"; "A quiet, willing, energetic worker whose services have been very satisfactory"; "The uniformly high quality of your work has enabled those using the information furnished by you to accept it with complete confidence in its reliability"; "Tactful in dealing with subordinates"; "Quiet and efficient."

"Quiet and efficient!" That portion of his record was emphatically demonstrated during the survey at the summit of Mint Canyon in Southern California. One day, unbeknownst to Chief Wildy and his party members, an apiary just over the hill was being robbed. Those bees were fighting mad! As the story goes, the instrument man glanced through the instrument and to his astonishment saw a level rod standing alone and unattended and watched as it gracefully fell to the ground. By the time he was able to interpret the wild flailing arm antics of the rod man, the mad bees were on him too. Where was Harry? In his quiet and efficient manner, bellowing like a bull, he was wasting no time in making tracks for the pickup. There was no time to open the door so he just stuck his head in through the window and frantically wound it up. The exact details of that episode have faded with the years but have lost little by repeated telling by Harry's friends.

THANK YOU

Mr. Kenneth C. Adams, *Editor*

Dear Mr. Adams: Your publication is one of the finest that reaches my desk—informative, concise and complete—it is a treasure. I do not keep a file of these; they are sent to Scotland, to my brother, who was a resident here years ago. I want to let him know how California is progressing. Thank you very much for your share in the magazine.

Sincerely,

H. D. Brown

New Light Success

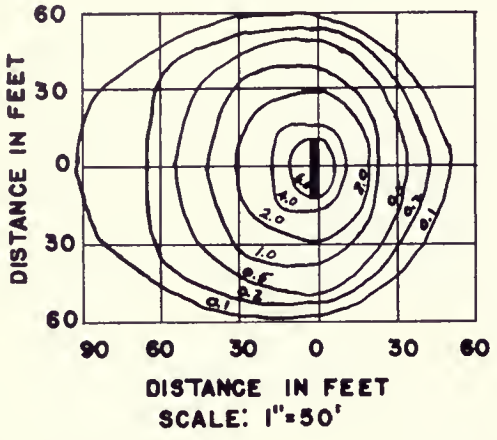
Fluorescent Luminaire Is Giving Satisfactory Results

By ROY MATTHEWS, Senior Electrical Engineer, Traffic Department

THE FLUORESCENT highway luminaire developed by the Traffic Department of the Division of Highways has been in use for over a year with satisfactory results.

This luminaire is designed for use at intersections only. It is mounted at the far right corner of the intersection and is so constructed that most of its light rays are directed back into the intersection.

Figure 1 shows the isolux curve of horizontal foot-candles for this unit when mounted at a height of 30 feet. The pavement directly underneath the luminaire is illuminated to a level of approximately 7 foot-candles. This is about twice as much light as obtainable with the common 20,000-lumen mercury vapor street lighting luminaire.



ISOLUX LINES OF HORIZONTAL FT.-CANDLES
Model 100 Fluorescent Intersection Luminaire
28' Mounting Height, Four 5800 Lumen, 600 ma.,
4500° White, 96 inch, T-12 Slimline Fluorescent Lamps

FIGURE 1



FIGURE 2



FIGURE 3

Construction of Luminaire

The fluorescent luminaire is constructed of 16-gauge sheet steel. The underside of the unit is white porcelain enameled finish and the top of the unit is dark green porcelain enameled. The reflector is of the open type, that is there is no glass cover.

Fluorescent lamps are usually designed to give the greatest light output at about 70 degrees Fahrenheit. It was first believed that the use of an open reflector such as used in this unit would not be practicable because the light output of the lamps would decrease with cool winter night temperatures. However, no visible decrease in light output has been evident.

Figure 1 shows that although most of the light is directed back into the intersection there is also quite a bit off the ends of the unit. Some of this light could probably be redirected back into the intersection, if desired, by the addition of a reflecting surface at the ends of the unit.

Figure 2 shows a daytime view of the intersection of Auburn Boulevard (U. S. 40) and Watt Avenue, a few miles northeast of Sacramento. Four of the fluorescent lights are used at this location. Two units are used at the intersection proper in the prescribed manner, and two others are used to illuminate the entrance to the left turn lanes on both approaches to the intersection.

The units provide good illumination of the intersection, but by far the greatest asset is the lack of glare. According to the Illuminating Engineer Society, there is no single factor so detrimental to visibility in roadway lighting as glare. Glare not only results in a reduction in visibility but also produces eye discomfort and fatigue.

Figure 3 shows a night view of the same intersection. The photographer was located fairly close to the first unit, which illuminates the entrance to the left turn lane. The brightness shown by this unit in the photograph would be cut off from the view of a driver by the vehicle's top. The remaining units shown illustrate the view of the approaching driver. Note that only a small horizontal line of light is visible to the motorist and this is of such small area that the motorist's visibility is not hindered.

Luke D. Packard

Continued from page 49 . . .

Varied Career

From 1906 until 1920, when he joined the Division of Highways, he had a varied career which included work with the Northern Pacific Railroad, the Washington Highway Commission, the Interstate Commerce Commission, and as Assistant County Engineer for Oklahoma County, Oklahoma.

Packard is married and has three children: William D., a captain in the U. S. Air Force stationed at Victoria, Texas; Mrs. Barbara J. Livesey of Walnut Creek; and Bruce, now with the Division of Highways at Markleeville.

He is a member of Sacramento Post No. 61 of the American Legion and has been active in Junior Legion Baseball for many years, holding the position of manager of the Post 61 team. He has also been active in the California State Employees Association, the Air Force Association, and the American Society of Photogrammetry.

Following his retirement Packard plans to continue in engineering work, specializing in aerial surveys.

ANOTHER LINK OF ARNOLD INDUSTRIAL HIGHWAY

WITHOUT fanfare or the usual ribbon cutting, the new five-mile link of the Arnold Industrial Highway between Pittsburg and Antioch was opened to traffic July 1st.

This new section of state highway, started on February 25, 1952, by Peter Kewit & Sons Co., is a four-lane divided freeway with provision for an ultimate expansion to six lanes.

Traffic interchanges have been built at Railroad Avenue, Stewartsville Road and at H Street-Minta Road. Future interchanges are planned for Somersville Road and at A Street. The latter will be part of the next contract for the continuation of the freeway.

Overcrossings have been provided at Harbor Street, Incinerator Road-Aberdeen Avenue and at Standard Oil Road.

Right of way, moving utilities and clearance cost $785,000. Construction of the freeway cost $2,621,000—making a total for the new section of $3,406,000.

In lieu of the usual ribbon cutting the Contra Costa Development Association hosted a dinner in Antioch for the highway commission and engineers from the Division of Highways on Wednesday evening, June 17th.

Arnold Freeway Facts

Railroad Avenue in Pittsburg to "A" Street in Antioch.

Length of project: 5.0 miles.

Type of construction: Four-lane divided freeway with provision for future expansion to six lanes.

Interchanges: Provided at Railroad Avenue, Stewartville Road, "H" Street-Minta Avenue.

Freeway overcrossings: Provided at Harbor Street, Incinerator Road-Aberdeen Avenue, Standard Oil Road.

Future interchanges (initial channelization): Somersville Road, "A" Street.

Contractor: Peter Kiewit & Sons Co.

Work began: February 25, 1952.

Work completed: July 1, 1953.

Cost of right of way, utilities and right of way clearance	$785,000
Cost of construction	2,621,000
Total cost	$3,406,000

Six Projects Cost $22,000,000

Including the 3.9 miles of the Eastshore Freeway completed on June 5th, and the Arnold Freeway, major state highway projects in the Bay area and completion dates are:

July 1—San Leandro Bay Bridge and approaches, Alameda.

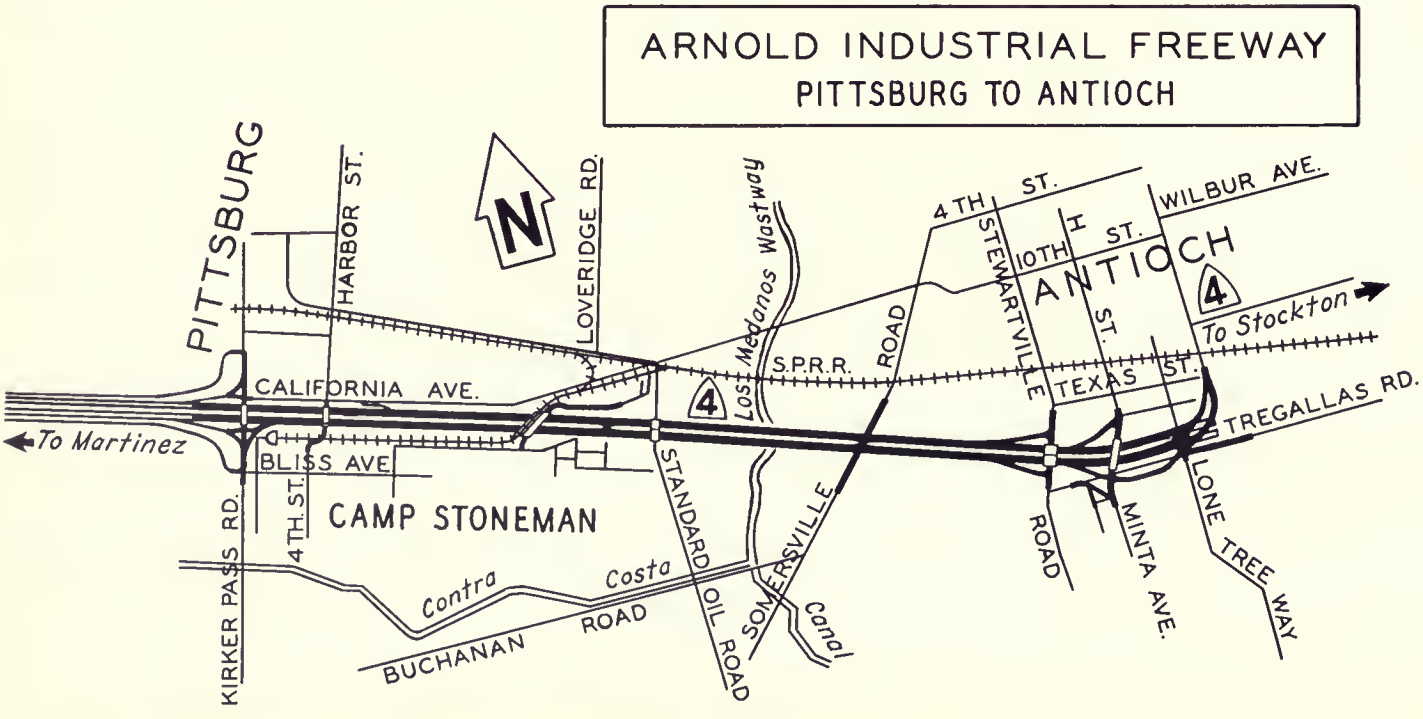
August—Bayshore Freeway through City of San Mateo, 2.6 miles.

August—U. S. 101 from California Park to Myrthle Street in San Rafael, two miles.

September—Bayshore Freeway in San Francisco from Army Street to Bryant Street.

The total cost of these six projects, including rights of way, is more than $22,000,000.

State Director of Public Works Frank B. Durkee pointed out that these projects are units in a long-range continuous program of state highway improvement which is being carried on as rapidly as available funds permit. They have been under construction for



varying lengths of time. Many other projects designed to provide further relief from congestion and hazard are under way in the Bay region, while still others have been included in the 1953-54 state highway budget but not yet placed under contract.

San Leandro Bay Bridge

The new San Leandro Bay Bridge replaces an old two-lane structure which is now being removed. This four-lane divided facility, with its approaches, totaling 0.9 of a mile in length, was constructed at an approximate cost of $2,194,000.

Bayshore Freeway

Extension of the Bayshore Freeway in San Mateo County as far as 16th Avenue, near the south city limits of San Mateo, will provide an additional 2.6 miles of six-lane divided highway for the heavy volumes of traffic which use this route. The cost, including rights of way, was about $2,750,000.

Meanwhile, construction is beginning on the next five miles of Bayshore Freeway to the south, through Belmont and San Carlos.

The most complex and costly of the summer-opening projects is the new section of the Bayshore Freeway extending north from Army Street in San Francisco, terminus of the existing eight-lane freeway unit which begins at Alemany Boulevard.

The job will provide eight lanes from Army Street to 17th Street, beginning in September. It will connect with a viaduct, already completed, which will be placed in service at the same time, to provide a connection to Bryant Street. When this section is opened to traffic, it will provide a by-pass for the entire length of Potrero Avenue.

The cost of the 1.3-mile unit from Army Street to 17th Street, including rights of way, is estimated at $4,819,000. The viaduct section cost an estimated $3,500,000 to construct.

Meanwhile, construction has begun on the Bayshore Freeway unit south from Alemany Boulevard to Third Street; and work is being carried forward on the fill for the proposed open-water section of the Bayshore Freeway across Candlestick Cove.

. . . Continued on page 60

Ramona Freeway

Continued from page 16 . . .

sion of Highways for right of way acquisition and construction.

First Construction in 1935

The first construction on the Ramona Freeway was in 1935, carried out by the State Division of Highways on the two-mile section in the City of Los Angeles from Aliso Street, east of the Los Angeles River, to the east city limits at Indiana Street. This construction was a conventional type, four-lane highway, with the exception that access rights of abutting property were acquired. Immediately after the war was over, this section was converted into a freeway with grade separations and central division strip. This was in 1946, and since that time much has been accomplished in the development of the Ramona Freeway.

All of the development in Los Angeles County has been and is being carried out on a full freeway basis, with all access rights of abutting property acquired and grade separations provided for all streets and highways and railroads that cross this freeway.

In San Bernardino County

In San Bernardino County the development is also on a full freeway basis from the Los Angeles county line through Ontario to Archibald Avenue, a distance of seven miles. From Archibald Avenue, just east of Ontario, to the west city limits of Colton, a distance of 15 miles, the development is on the basis of providing a limited access freeway, or "expressway," with full or partial control of access but without grade separations at streets and highways that cross the freeway.

Over the entire length of the Ramona Freeway substantially all of the required right of way has now been secured in San Bernardino County and in Los Angeles County from the westerly terminus of the Ramona Freeway at Aliso Street to Rosemead Boulevard. From Rosemead Boulevard easterly to the Los Angeles-San Bernardino county line, much of the right of way has been acquired and right of way agents of the State Division of Highways are now active in the El Monte to Pomona area. In the Cities of Claremont and Pomona all rights of way needed have been obtained. The Division of Highways now has in progress eight major construction contracts on the Ramona Freeway which are in various stages of completion.

Fifteen Miles Completed

Completed as of this date are the 15 miles of limited access freeway in San Bernardino County between Archibald Avenue and the west city limits of Colton that was first opened to public traffic in the spring of 1947, and in Los Angeles County the 6.2 miles of full freeway between Aliso Street in Los Angeles and Atlantic Boulevard in Alhambra. The date for completion of contracts now in progress in Los Angeles County from Atlantic Boulevard to Rosemead Boulevard is December, 1953. When this construction work is finished there will then be 10 miles of completed full-freeway construction between Aliso Street and Rosemead Boulevard.

Due to the fact that the State Highway Commission adopts budgets each year designating where available funds shall be spent on highway projects, it is not possible to establish a construction schedule for unfinanced portions of the Ramona Freeway, or to establish any date for final completion throughout. The Highway Commission in adopting its budget for the 1953-1954 Fiscal Year has allocated $7,300,000 additional funds for continuing construction on the Ramona Freeway.

Financed from this allocation, bids were opened in Los Angeles on March 12th to complete the four-lane freeway from the Los Angeles-San Bernardino county line easterly through Ontario to Archibald Avenue, a distance of 7.2 miles. The low bidder was: J. A. Payton, George Herz and Company, and Clyde W. Wood & Sons of Riverside. The total of the low bid was $2,308,178.22. On April 30, 1953, bids were opened for an adjoining 6.34 miles of four-lane freeway from the Los Angeles-San Bernardino county line westerly through Claremont and Pomona to San Dimas Avenue. Guy F. Atkinson Company was the low bidder and the total of the low bid was $3,389,766. Construction is well under way on both of these contracts.

STATE CHAMBER SUBMITS HIGHWAY RECOMMENDATIONS



Members of California Highway Commission and engineers of the Division of Highways at luncheon with officials of California State Chamber of Commerce

On JULY 23d the California State Chamber of Commerce submitted to the Highway Commission in Sacramento recommendations for 108 state highway improvement projects for the Sacramento Valley region and in line with its long established custom entertained the members of the commission and engineers of the Division of Highways at a luncheon at the Senator Hotel.

The recommendations were part of some 458 highway improvements contained in the state chamber's entire report on road and highway conditions in all parts of California. They will be considered by the Highway Commission in its study of the 1954-55 highway budget.

The projects were submitted by William J. Tunison, Westwood, Chairman of the Sacramento Valley Highway Committee of the California State Chamber of Commerce, who was introduced to the commissioners by F. W. Tarr, Chico, Vice Chairman of the State Chamber's State-wide Highway Committee.

The projects listed reflected the combined thinking of some 1,500 business, farm and civic leaders from all of the State's 58 counties. The project recommendations were formulated during a series of 41 regional meetings arranged in cooperation with local civic organizations, officials of cities and counties and interested farm and business leaders. These "grass roots" conferences were held over a two-months' period in various parts of the State.

The recommendations were made with the consultation and approval of business and civic leaders throughout the Sacramento Valley area.

Early Days

Continued from page 45 . . .

Association. These letters all complained about the damage to highways by overloaded auto trucks.

The October 20th minutes note letters from the following counties: Solano, Lassen, Sonoma, Santa Cruz, Los Angeles, and from the San Diego Draymen's Association, Upper Lake Chamber of Commerce, A. L. Wisker of Grass Valley, from Tom McCormick, and from the Automobile Club of Southern California, all complaining about the breaking up of the highways by overloaded trucks.

New Personnel

Personally, I do not think it necessary to go through the minutes of the years following 1921. What struck me, when I first began this series, were the difficulties the Highway Commission encountered and overcame in getting an organization together accomplishing what it did on our highways. Even in those days the Highway Commission worked under a terrific handicap due to lack of funds. Although from time to time the Legislature authorized bond issues and finally passed the gas tax, it still didn't help matters when it came to building the number of roads and the kind of roads that were necessary to carry the ever-increasing automobile traffic.

To start with, the Motor Vehicle Department was part of the Highway Commission, and was such for quite a number of years. It was in 1931 that the Legislature took this division from the Department of Public Works and set it up as a separate department in the State. This, of course, lessened the work of the Highway Commission a great deal. It was in 1928, when Bert B. Meek of Oroville was appointed Director of Public Works, that the late C. H. Purcell was named State Highway Engineer and Chief of the Division of Highways.

The Highway Commission, as such, changed during the regimes of different Governors. It was finally in January of 1943 that the Legislature set up the commission as it is today.

Earl Warren assumed the office of Governor in January, 1943, and immediately appointed State Highway Engineer Purcell to the post of Director of Public Works. George T. McCoy moved into Purcell's position as State Highway Engineer. The commissioners who were then in office all resigned and for a period of several months there was an interim commission, until September, 1943. At that time Governor Warren appointed the present commission, with two exceptions. C. Arnhold Smith of San Diego resigned in January, 1949. He was succeeded by Charles T. Leigh of San Diego. A few months ago, Homer P. Brown of Placerville resigned, and Governor Warren appointed H. Stephen Chase, of Sacramento, to take his place. The rest of the commission, as presently organized, are the original appointees of 1943, who have been reappointed as their terms expired.

Artesia

Continued from page 14 . . .

The portion of the Artesia Street improvement now under construction is scheduled to be completed in August of this year. Future construction between Alameda Street and Central Avenue, a distance of 1.8 miles, will include the construction of three bridges; one over the Pacific Electric Railway, a second over Compton Creek Channel and a third over the tracks of the Southern Pacific Railroad and Alameda Street.

Complete Interchange

A complete interchange will be provided between Alameda Street and Route 175 to be constructed in two quadrants. Construction schedule has not yet been set for this improvement for which plans are now nearing completion.

From Central Avenue west to Main Street, a length of 1.5 miles, is the first completed section of this east-west highway. It was completed in 1939 as a divided highway on a limited access basis. To the west of Main Street this state highway is 174th Street and Redondo Beach Boulevard. As of this time two contracts are in progress, one 1.2 miles long from Pier Avenue in Redondo Beach to Inglewood Avenue, and the other contract 3.6 miles long from Inglewood Avenue to Normandie Avenue. The remaining section, 1.5 miles between Normandie Avenue and Main Street, is now in the final design stage, with right of way acquisition under way.

Thus good progress is being made in the improvement of State Highway Route 175 to meet the east-west traffic demand in the southerly portion of the Los Angeles metropolitan area.

WHAT ABOUT ANOTHER VISIT

COUNTY ROADS BOARD
Exhibition Building
Rathdown Street, Carlton, N. 3
Victoria, Australia

1st June, 1953

The Editor, California Highways and Public Works,
Sacramento, California, U. S. A.

DEAR SIR: It is just a shade over 26 years since I called at the Office of the State Highway Commission, as it then was, and saw the then Chief Engineer, Mr. Robert M. Morton, and others. Mr. Morton was good enough to put me on the mailing list for *California Highways and Public Works* and I have received copies regularly ever since.

The publication is one of the best of its kind in the world, and is always eagerly sought after by our construction and other engineers who make full use of the technical articles. The descriptions of limited access highways and the very practical articles dealing with methods of assessing compensation to be paid adjacent landowners are most valuable and when public opinion in this country has been educated to the need for limited access highways, this wealth of information will be of great assistance, firstly in drafting the necessary legislation and subsequently in administering it. Unfortunately, that time has not yet arrived but we still live in hope.

With kind regards and wishing you and your Highway Commission continued success,

Yours sincerely,

J. MATHIESON
Deputy Chief Engineer

CORNING

Corning, located in Tehama County, is known principally for its ripe olives.

Recreational Road

Another Link in Inyo's FAS Program Completed

By L. E. ELDER, District Construction Engineer

On June 12, 1953, another federal-aid secondary project was completed and opened to unrestricted use to vacationists and sportsmen seeking recreation in the high Sierra region west of Big Pine, Inyo County.

The completed project is a portion of Inyo County's Federal-aid Secondary Road No. 1069 which originates at Glacier Lodge resort and extends easterly for a total length of 10.4 miles to the town of Big Pine. The route is known locally as the Glacier Lodge Road.

Early Dirt Road

Access to the Glacier Lodge area was originally over a narrow, dirt road, constructed sometime early in the 1900's, along the south side of Big Pine Creek and was used primarily to haul lumber from an early day sawmill located a short distance east of the present Glacier Lodge resort. Later, the sawmill was abandoned and the farmers in the vicinity of Big Pine assumed the maintenance of the old road as a means of access to small dams and irrigation control structures located along the upper reaches of Big Pine Creek.

In 1925 the City of Los Angeles started to develop the area as a potential source for electrical power. During this latter stage of development, the city relocated the road to its present location along the north side of Big Pine Creek Canyon. The road was then later turned over to the County of Inyo and made a part of the county road system.

Recreational Highway

The Glacier Lodge road is now primarily a tourist road and affords one of the many accesses to the popular hunting and fishing areas for which Inyo County is noted.

In addition to the recreational facilities in the immediate vicinity of the lodge, considerable interest is created for the hardier type of recreation seeker by the presence of high level lakes and an existing glacier, which are accessible only by pack trail. The glacier is known as the Palisades Glacier and is reported to be the most southerly located glacier in the United States. The glacier is located in extremely rough country between 8 and 10 miles west of the Glacier Lodge resort, at an elevation of about 13,000 feet above sea level.

Steep, Tortuous Road

The portion of the Glacier Lodge road just completed was the portion between 3.4 miles west of Big Pine to the Glacier Lodge resort for a total length of 6.4 miles. The existing road through this portion consisted of a roadbed varying in width from 16 to 20 feet, with the central 14 feet surfaced with a bituminous surface treatment which had been applied by Inyo County subsequent to its inclusion in its county road system. The greater portion of the improved section is constructed along the northerly slope of the deep gorge through which Big Pine Creek flows to its junction with the Owens River. The original road followed the general contour of the adjacent mountainside and, as a consequence, was a tortuous, steep, crooked road rising from an elevation of 5,100 feet to 7,780 feet in a little over six miles.

The new construction provides a 24-foot roadbed with the central 20 feet surfaced with road-mixed surfacing for a depth of three inches. The alignment in general follows the existing alignment and grade, except at various locations where the sharp radius curves presented a traffic hazard.

Alignment Readjustments

Minor adjustments were made in the alignment at these locations which provided for improvement of the horizontal sight distance to conform to the minimum standards required by the Bureau of Public Roads. Excavation slopes were constructed to a 1:1 slope and due to extremely rocky nature of the material, were finished in accordance with the requirements specified for Class "B" slopes.

Mineral aggregate for road-mixed surfacing was obtained from the roadway prism near the center of the project. In order to obtain sufficient material from this source, it was necessary to obtain permission from the United States Forest Service to daylight the cut slope on the side adjacent to Big Pine Creek. The excavation slopes on the lower side of the roadway prisms were purposely made flat and uniform at the request of the United States Forest Service to provide a rest area for vacationists.

County Project

The construction work was performed by Ball and Simpson, Berkeley, California, at a cost of $210,000, exclusive of engineering. The project was financed from federal-aid funds supplemented by funds made available to the counties under provisions of Chapter 20 of the County Highway Aid Act and the Collier-Burns Bill of 1947.

Construction engineering forces used on the project were all county employees, under the direct supervision of County Road Commissioner J. K. Smith. R. W. Fisher was the resident engineer on the project. Administrative assistance was furnished the county on behalf of the California Division of Highways by Milton Harris, District Engineer, District IX, and the author.

The photographs on the opposite page are before and after pictures showing improvements on Glacier Lodge Road in Inyo County

BEFORE AFTER



Ben Ali Freeway

Continued from page 43 . . .

Seven Structures

The location and description of the bridges are as follows:

Fulton Avenue Overcrossing

Reinforced concrete slab bridge, consisting of two spans about 117 feet in total length, supported on a reinforced concrete bent and abutments, and providing a clear roadway width of 28 feet and two 5-foot sidewalks.

Auburn Boulevard Ramp Overcrossing

Reinforced concrete box girder bridge consisting of two spans about 144 feet in total length, supported on a reinforced concrete pier and abutments and providing a clear roadway width of 22 feet.

Watt Avenue Overcrossing

Reinforced concrete box girder bridge consisting of two spans about 181 feet in total length, supported on a reinforced concrete bent and abutments, and providing a clear roadway width of 52 feet and one 5-foot sidewalk.

Arcade Creek

Reinforced concrete slab bridge composed of two parallel structures; each structure consisting of three spans about 103 feet in total length, supported on concrete pile bents and providing clear roadway widths of 28 feet.

Madison Avenue Overcrossing

Reinforced concrete box girder bridge consisting of two spans about 175 feet in total length, supported on a reinforced concrete bent and abutments, and providing a clear roadway width of 28 feet and one 5-foot sidewalk.

Spruce Avenue Overcrossing

Reinforced concrete box girder bridge consisting of two spans about 132 feet in total length, supported on a reinforced concrete bent and abutments and providing a clear roadway width of 28 feet and one 5-foot sidewalk.

East Antelope Road Overcrossing

Reinforced concrete box girder bridge consisting of two spans about 175 feet in total length, supported on a reinforced concrete bent and abutments.

Frank E. Burnside

Continued from page 48 . . .

automotive fire equipment in the City of Sacramento, having been hired by the city to instruct the firemen in the handling of the complicated chemical truck. Many of the men he instructed are now retired from the Sacramento Fire Department—men like former Chief Anderson, who became so excited on his first trip down K Street with Burnside in an old Rambler that he tore the handle from the bell serving in lieu of a siren. Some of the old-timers may recall that Terence Mulligan, the present chief, was then a call-man who reported to fires on his bicycle.

Burnside's enthusiasm for automobiles led him to take part in the early day "road races" to Lake Tahoe, when California's highways were but a series of bridgeless creek crossings and but little better than graded trails. The route was from the Sacramento Hotel to Folsom, then over the old Green Valley Road to Placerville, over Echo Summit to Meyers and Tallac on Lake Tahoe and return to Sacramento. In 1913, the cup went to Burnside for driving the first car of the year to make the Sacramento-Lake Tahoe round-trip under its own power. The car was a Chalmers "Model 30" touring car—minus top or windshield which alone speaks volumes for Burnside's hardihood.

Good Driver

Prior to World War I, and also immediately after his employment by the State following the war, Burnside's reputation as a driver and mechanic caused him to be selected as chauffeur on the longer, more arduous, tours of Governor Stevens, Highway Commissioners Stern, Darlington, Whitmore and Mansfield; State Highway Engineer A. B. Fletcher, and a Congressional Committee of Investigation on Orientals in California. The unimproved roads and the unreliable automobiles of that day made it imperative that a skillful driver and excellent mechanic accompany each group, if any adherence to schedule was to be maintanied. It is to Burnside's credit that each tour was successfully completed, even when it was necessary to drive all day, and then spend the greatest part of the night underneath the vehicles preparing them for the next day's run.

Served in Navy

In 1917, the Nation's entry into World War I led him to enlist in the Navy. He was assigned to the destroyer *USS Taylor*, later transferred to aviation and eventually commissioned chief petty officer and appointed instructor in blimp and airplane construction and maintenance at Great Lakes Naval Training Station, where he received his discharge in April, 1919.

In his service with the State, Burnside personally designed and supervised the construction of many of the devices, some of which are now internationally known, that have helped to bring our highway system to its present state of efficiency. Among these are the traffic-striping equipment and the special oil-distributor trucks and other types of asphalt-handling equipment used throughout the State.

When the equipment department was first formed, he was selected to tour the war plants to procure the necessary shop machinery and tools for the various shops in the State, as well as to procure much of the automotive and construction equipment for the Division of Highways. So keen was his judgment that much of the machinery he selected is still in service today.

During World War II he was borrowed by the U. S. Bureau of Public Roads for duty as equipment administrator on the Alcan Highway in northern British Columbia and the Yukon Territory. After successfully completing his assignment he was returned to state service.

In his interesting and varied experience, Burnside made many friends among those in private industry as well as those in the service of this and other states. His never-failing good humor and his winning personality won for him the sincere affection and respect of his associates.

At the moment, he is too busy enjoying the company of Mrs. Burnside and their two charming children, Bobby and Jane, to make any definite plans for future activity. For the first time he is able to devote as much of his time to them as he wishes.

Traffic Trends

Volumes of Travel on Rural State Highway System Steadily Increasing

By R. J. ISRAEL, Assistant Traffic Engineer

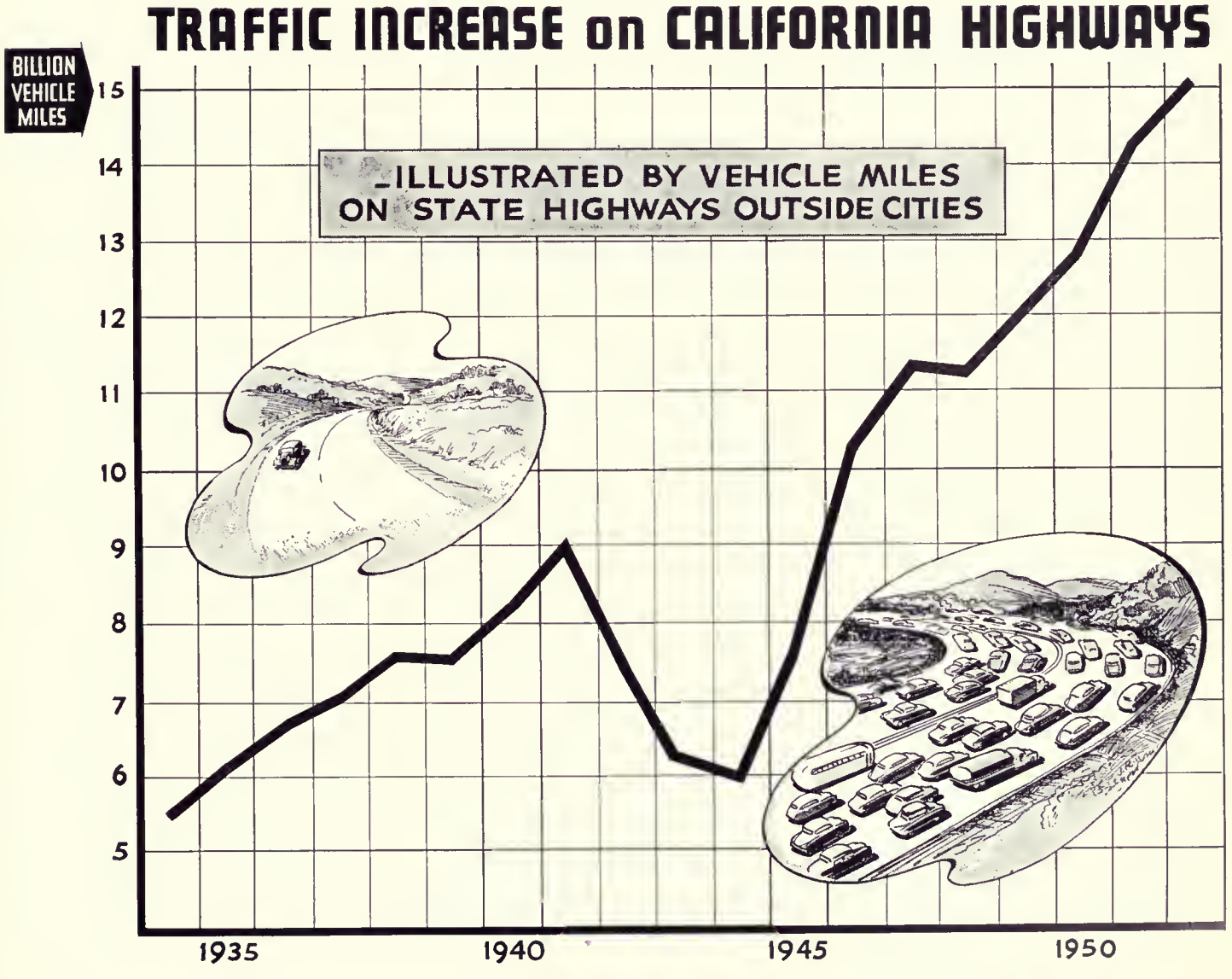
Increasing traffic volumes on California's highways are as relentless as the tides. The *accompanying graph* shows the yearly recorded vehicle miles of travel on the Rural State Highway System. Except for the decline caused by gas rationing and other wartime travel restrictions from 1942 to 1944, the trend has been and is constantly upward.

Vehicle miles of travel on the Rural State Highway System for 1952 is estimated as 14,983,000,000. This value is 2.7 times the estimate for 1934 when the existing annual traffic count was first established.

Traffic volumes for each section of the Rural State Highway System are obtained from approximately 1,000 annual count locations, with volumes adjusted through 85 monthly count stations and 15 seven-day stations. All such counting is done manually in order to include classification by type of vehicle.

Rural Traffic Is Heavy

Rural state highways, representing only about 11 percent of the total road mileage in the State, now carry almost 30 percent of the state-wide traffic. The urban portions of the State Highway Sytem carry much higher traffic volumes than do the rural. However, due to the great number of count locations



required to effectively determine city traffic totals, urban travel is not obtained on an annual basis.

One phase of urban travel which is determined annually is that on the urban full freeways. These freeways are developing the highest traffic volumes ever recorded in California, and seldom exceeded elsewhere. The two and one-half mile portion of the Hollywood Freeway between Grand and Silverlake Avenues had an average daily traffic of 110,000 vehicles in 1952 while the Highland to Barham portion of the same freeway averaged 115,000 vehicles per day. Traffic on the eight-lane portion of the Arroyo Seco Freeway frequently exceeds a daily volume of 100,000 vehicles and the San Francisco-Oakland Bay Bridge also exceeded 100,000 on its maximum day of record.

Freight and Passenger Traffic

The percentage of freight vehicles on the highway system has remained fairly constant through the years, that is, in numbers trucks are increasing at generally the same rate as passenger vehicles. However, loads have increased greatly. This is due both to heavier loans by type of freight unit and increasing percentages of multivehicle units, particularly semitrailer combinations. Average weight of loaded freight vehicles, as recorded by the 1952 loadometer survey, was 2.3 times the average recorded by the 1936 survey.

The rate of increased travel on the Rural State Highway System is held down to some extent by reductions in road miles. Although total state highway mileage has remained virtually constant since 1934, the rural portion is periodically losing high traffic sections due to expansion of incorporated cities. Another factor which tends to retard the growth of traffic on the State Highway System is traffic saturation. Many miles of highways, and particularly those that feed our metropolitan areas, are carrying volumes far above their rated capacity. Under such conditions congestion during peak hours may cause traffic to be diverted from the highway when an alternative route is available. An example of the latter is the one-way couplet just north of the City of Sacramento. Although the 12th Street extension is carrying the heavy southbound traffic of U. S. 99, this traffic cannot be included since 16th Street is the State Highway.

With an expected 6,000,000 registered vehicles in California for 1953 and a continually expanding population, traffic must continue to rise at a substantial rate. Freeways, as have been demonstrated, can carry hugh volumes of traffic safely and rapidly. The extension of freeways on the major routes and improved standards throughout the system are essential to accommodate present and anticipated traffic volumes on California state highways.

Arnold Highway

Continued from page 53 . . .

Marin County Project

The six-lane freeway construction on U. S. 101 (Francisco Boulevard) leading from California Park north into San Rafael for a distance of two miles will benefit Marin County and Redwood empire traffic, beginning in August. This improvement, involving an estimated over-all cost of $1,552,000, will eliminate a traffic bottleneck at the San Quentin Wye.

Another important state highway project under contract in the Bay region is the widening of the Eastshore Highway north of the Distribution Structure in Oakland, and its conversion to a full freeway, with interchanges at Powell and Ashby Avenues, at a construction cost of about $3,000,000.

On U. S. 50, just east of Hayward, a $1,412,000 contract is under way on 2.2 miles of freeway through Castro Valley. This improvement will, when completed, mark another step forward in the progressive modernization of the major highway connection between the Bay region and the San Joaquin Valley. Still another project on this route, consisting of seven and one-half miles of expressway, is under way between the Altamont Pass and Tracy.

REDUCE LIGHT POWER

The high power of today's headlights makes it all the harder to drive safely in fog unless the car owner remembers to use the lower or city-driving beam when the air is saturated with moisture.

Rural Road Inventory

Continued from page 31 . . .

Private individuals and many types of businesses purchase the maps from the State.

Staff

The state-wide highway planning survey is a part of the planning department, which is headed by Assistant State Highway Engineer J. W. Vickrey. In direct charge of the planning survey is F. M. Reynolds, Principal Highway Engineer under Vickrey. The writer is responsible for the road inventory section.

The close cooperation between the counties, the Bureau of Public Roads, and the Division of Highways in the rural road inventory program is a great aid in the over-all planning and development of the transportation system in California.

ON TRAFFIC PAINT

State of New York
DEPARTMENT OF PUBLIC WORKS
Buffalo, N. Y.

May 18, 1953

Mr. Kenneth C. Adams, *Editor*

Dear Mr. Adams: After reading the article, "Traffic Paint," by E. D. Botts, which appeared in the March-April issue of *California Highways and Public Works*, I sent it on to one of our other district engineers, who is presently chairman of a state committee studying traffic paints and pavement marking procedures.

If extra copies of this issue are available, I would appreciate your sending me a couple more, as I desire to review the article again and have it in the files for future reference.

I always look forward to receiving my copy of your magazine as the articles are well prepared and always interesting to me and my staff. The photos of construction projects, pavement markings and signs are especially sharp and well taken. It would be very worthwhile if more of the states could arrange to publish a similar magazine.

Sincerely yours,

Chas. R. Waters
District Engineer

COUNTIES TO GET NEW STATE AID FOR ROADS

By H. L. JOYNES, Assistant Engineer of Federal Secondary Roads

While congressional committees are discussing the advisability of continuing federal aid for county road construction, California's legislators and Governor have endorsed the program in no uncertain terms by approving Senate Bill No. 1961, now Chapter 1871 of the Statutes of 1953. The new legislation which amends the Secondary Highways Act of 1951, provides state matching funds limited to a maximum of $50,000 per year per county for the 87½ percent of California's federal-aid secondary funds that are reapportioned to the counties. The 57 * rural counties will receive amounts sufficient in the smaller counties to match all of their FAS funds.

As this issue of California Highways and Public Works goes to press, *no official interpretation of every phase of the new statute is available.* Therefore, this article must be confined to generalities.

One provision, regarding which there seems to be no doubt, repeals the section of the Secondary Highways Act of 1951 that required all relinquished FAS funds to remain in the relinquishing county for expenditure on state highways in the Federal-Aid Secondary Highway System. An amendment added provides that all federal funds apportioned to a county and not claimed or used by that county shall be expended on state highways in the FAS System in any county in that county group including the county from which released. This provision has the effect of transferring any federal-aid secondary funds released by any county, to the State Highway Fund, from whence they will be budgeted to projects upon the state highway portion of the Federal-Aid Secondary System in the same manner as any other federal-aid funds. Logically, even the few counties which have not heretofore participated in the program will now do so.

* San Francisco, being entirely urban, does not participate in the FAS program.

Progress Reviewed

While we are awaiting the effective date of the new legislation (September 9, 1953), it seems proper to pause and reflect on the progress made under the postwar Federal-Aid Secondary Program. By progress, we do not mean necessarily the number of miles of road and the number of bridges built, but for those of you who are statistically minded, we have prepared tables showing such information which you will find printed on these pages. We are referring to the less obvious aspects of the Federal-Aid Secondary Program, which when brought into the limelight, are much more spectacular and important than the figures in the tabulations.

When, on June 1, 1945, State Highway Engineer George T. McCoy created a separate department within the Division of Highways for administering the county portion of the Federal-Aid Secondary Highway Program,* he also set a pattern which was soon followed by many other states. Because California is too large for efficient centralized functioning of such a program and because it was important that benefits gained from this new field of county-state cooperation be spread as widely throughout the State as possible, it was determined that the new department would operate through each State Highway District Engineer who assigns an engineer to actuate the program in close contact with the county authorities. Congress amended the Federal Highway Aid Act in 1950 so as to require that every state establish such a department.

New Administrative Unit

Due to the absence of centralized control of road matters within each county, this new administrative unit within the California Division of Highways experienced difficulty in some cases. At that time, most California counties had their road systems divided into five districts identical with the districts represented by the five elected county supervisors, with each supervisor administering the road affairs of his own district. In such counties, each district not only kept road taxes collected within its boundaries, but often because no agreement could be reached between the five supervisors for a more equitable distribution of state-collected motor fuel tax apportionments, such funds were divided equally between the five road districts. It was these early difficulties of satisfactory county-state cooperation in road matters which prompted the California Legislature to write into the Collier-Burns Highway Act of 1947, a provision requiring each county board of supervisors acting as a unit to appoint one road commissioner who would be in charge of all road matters in the county, and be responsible only to the board of supervisors acting as such. It should be noted that the basic concept of local government has not been altered, but opportunities for better operation have been improved both internally and in coordination with other governmental units.

* H. B. LaForge heads this unit, which during the reorganization of 1947 became one of the functions of administration under Assistant State Highway Engineer Richard H. Wilson.

County Road Commissioners

Because many of the counties already had competent nonregistered engineers within their organizations, the Collier-Burns Highway Act of 1947 permitted the board to appoint any other person it believed qualified and competent to administer the county's road affairs. Thirty-two of the 58 counties have road commissioners who are registered civil engineers and two others are licensed land surveyors. Although the law required centralized road control in every county this change was not accomplished overnight, even though all counties were required to appoint a road commissioner to avoid loss of state-collected tax apportionments. However, after six years it appears that practically all of the counties are operating their road

SUMMARY OF COUNTY AND STATE HIGHWAY PROJECTS UTILIZING POSTWAR FAS FUNDS THROUGH JUNE 30, 1953

	No. of contracts	No. of bridges	Miles of road	Total cost	Federal-aid secondary and county highway aid act funds	Other funds
County Projects						
Under contract			116.160	$4,688,809.20	$2,450,147.62	$2,238,652.58
		7		784,645.84	329,398.00	455,247.84
	30			$5,473,446.04	$2,779,545.62	$2,693,900.42
Completed			1,121.046	$35,085,561.94	$25,060,433.68	$10,025,128.26
		160		12,533,465.67	9,881,949.72	2,651,515.95
	312			$47,619,027.61	$34,942,383.40	$12,676,644.21
Totals	342	167	1,237.206	$53,092,473.65	$37,721,929.02	$15,370,544.63
State Projects						
Under contract			62.958	$4,242,808.83	$1,560,992.58	$2,681,816.25
		10		1,027,646.70	469,924.87	557,721.83
	16			$5,270,455.53	$2,030,917.45	$3,239,538.08
Completed			72.812	$6,131,868.73	$2,905,664.31	$3,226,204.42
		17		2,614,166.56	1,325,088.00	1,289,078.56
	26			$8,746,035.29	$4,230,752.31	$4,515,282.98
Totals	42	27	135.770	$14,016,490.82	$6,261,669.76	$7,754,821.06
Grade Crossing Protection						
70 crossings	64			$279,036.80	$265,000.00	$14,036.80
Grand Totals	448	194	1,372.976	$67,388,001.27	$44,248,598.78	$23,139,402.49

The above totals do not include the 1½ percent of the federal-aid secondary funds that are required to be expended for highway planning. These funds and the grade crossing protection funds are taken from the 12½ percent not apportioned to the counties. The average cost of the 167 county bridge projects is $79,749, and the average cost per mile of the 1,237.206 miles of county roads constructed under the program is $32,149.

departments as a single unit. The Federal-Aid Secondary Road Program has, to some extent, aided in accomplishing the change-over, for during the years when no state matching funds were available, it was not difficult for the counties to see the fallacy of dividing an already small federal apportionment five ways and thus requiring five small uneconomical contracts. These are the less obvious things we refer to as "progress."

Federal Aid Phase

Progress in another phase of the program stands out noticeably in reviewing R. F. Reynolds' article on the history of federal aid for highways in California which appeared in the January-February, 1950, issue of this magazine. The phase referred to is the development of an integrated road system for the purpose of determining projects eligible for federal aid. The original Federal-Aid Road Act of 1916 did not designate a system, but permitted the expenditure of federal aid for the improvement of any rural road over which the United States mails were then or might thereafter be transported, a provision so broad as to include almost any rural road. After five years of such haphazard expenditure of federal-aid highway funds, the Federal Highway Act of 1921 required the designation of a system of federal-aid highways, limited to not more than 7 percent of the total rural road mileage in the State. The experience gained in developing such an integrated road system proved useful when the Federal-Aid Highway Act of 1944 was enacted, and the substantial allotment for secondary roads provided by this act was

STATUS OF THE 87½ PERCENT OF CALIFORNIA'S FEDERAL-AID SECONDARY HIGHWAY FUNDS MADE AVAILABLE TO THE COUNTIES

Federal act and fiscal year	Total apportionment to counties	Relinquished for state FAS roads	Retained for county FAS roads
1944 Act			
45-46 Fiscal Year	$4,496,427.00	$132,697.00	$4,363,730.00
46-47 Fiscal Year	4,496,426.00	129,241.00	4,367,185.00
47-48 Fiscal Year	4,496,426.00	73,400.00	4,423,026.00
1948 Act			
49-50 Fiscal Year	4,020,746.00	592,458.00	3,428,288.00
50-51 Fiscal Year	4,027,439.00	381,683.87	3,645,755.13
1950 Act			
51-52 Fiscal Year	4,622,503.00	703,895.00	3,918,608.00
52-53 Fiscal Year	4,573,916.00	374,562.00	4,199,354.00
1952 Act			
53-54 Fiscal Year	5,082,669.00	378,027.45	4,704,641.55
Totals	$35,816,552.00	$2,765,964.32	$33,050,587.68

required to be expended on a system consisting of the principal secondary and feeder roads, including farm-to-market roads, rural free delivery and public school bus routes, either outside of municipalities or inside of municipalities of less than 5,000 population. The system was to be selected by the state highway departments in cooperation with the county supervisors, county commissioners or other appropriate local road officials and the United States Commissioner of Public Roads.

Problems Encountered

The Federal-Aid Highway Act of 1948 continued these stipulations as to the system, but the Federal-Aid Highway Act of 1950 omitted the word "principal" from "principal secondary and feeder roads" and added the terms "local rural roads, county roads, township roads, and roads of the county road class." Apparently these changes which favor a more rural type project were sponsored by Congressmen from the predominantly rural states whose counties were having difficulties in securing adequate state cooperation. The situation which brought about this change in the act never existed in this State. By legislation, California has guaranteed the counties 87½ percent of the FAS funds allotted and the Division of Highways has always encouraged the counties to select their own projects in conformance with their greatest needs.

California is the fastest growing state in the Union, has the highest motor vehicle registration and its county roads carry three and one-half times more traffic than the national average for such roads. Because of this high traffic density, California counties have surfaced over 86 percent of their rural road mileage, compared with a national average of less than 50 percent, leaving unsurfaced only little used mountain and desert roads which would be uneconomical to maintain in a surfaced condition. Oiled or paved county roads exceed 50 percent in California, whereas the national average is about 10 percent. Having successfully accomplished their purpose of bringing the "last man out of the mud," many California counties must turn their attention to a bigger problem of providing adequate traffic arteries in the fringe areas close to urban centers where traffic is unable to move freely between farm and market due to inadequate highway capacity.

Because the 1950 and 1952 Federal Highway Acts stress projects having rural characteristics, the more densely populated counties within California are having difficulty in applying the implied pattern. Although multilane projects are presently avoided if possible, we feel that the federal authorities will eventually succeed in securing a more liberal interpretation of the law in order that the *most needed projects* on the secondary and feeder roads in every county can be included in the Federal-Aid Secondary Program, whether it be a county in the most rural section of the country, or a county in one of the most populated sections. After all, California counties should not be penalized for twoscore years of local taxation and determined effort.

FEDERAL-AID SECONDARY HIGHWAY FUNDS
1953-54 Fiscal Year Apportionment to the Counties

The Secondary Highways Act of 1951 fixes the counties' share of the California apportionment at 87½ percent, which is the same percentage used for each year's funds since the beginning of the present program in 1945.

County	Apportionment	County	Apportionment
Alameda	$61,905	Orange	$103,212
Alpine	25,413	Placer	64,573
Amador	25,675	Plumas	54,461
Butte	93,435	Riverside	195,832
Calaveras	31,052	Sacramento	121,240
Colusa	30,518	San Benito	36,163
Contra Costa	104,929	San Bernardino	360,860
Del Norte	25,413	San Diego	192,509
El Dorado	46,327	San Francisco	------
Fresno	273,481	San Joaquin	121,405
Glenn	40,118	San Luis Obispo	84,118
Humboldt	112,692	San Mateo	31,650
Imperial	109,083	Santa Barbara	76,125
Inyo	127,489	Santa Clara	122,345
Kern	231,198	Santa Cruz	49,108
Kings	61,900	Shasta	86,835
Lake	36,176	Sierra	25,413
Lassen	73,712	Siskiyou	121,854
Los Angeles	216,419	Solano	48,934
Madera	65,791	Sonoma	138,751
Marin	36,972	Stanislaus	126,664
Mariposa	31,456	Sutter	37,812
Mendocino	92,761	Tehama	60,703
Merced	95,473	Trinity	52,074
Modoc	62,300	Tulare	205,172
Mono	46,577	Tuolumne	43,427
Monterey	113,130	Ventura	92,761
Napa	50,895	Yolo	44,887
Nevada	32,052	Yuba	29,439
		Total	$5,082,669

Objectives Restated

The most important objective of the Federal-Aid Secondary Program is to require cooperation between the state and county road officials to the end that every county will have an efficiently operated and adequate road department. The best way of accomplishing this objective is through the cooperative construction of adequate modern highways by contract to give that department experience in designing and supervising the construction of such highways. We feel that much progress has been made toward reaching this objective, especially in that the counties are taking advantage of the opportunity to help themselves.

It will be noted from an examination of the table headed "Status of the 87½ Percent of California's Federal-Aid Secondary Highway Funds Made Available to the Counties," that the total funds relinquished each year by the counties was less under the 1944

federal act than under subsequent acts. This is explained by the fact that state matching funds totaling $12,000,000 were provided by the County Highway Aid Act of 1945 to match the federal funds apportioned to the counties from the Federal Highway Act of 1944 in order to give impetus to the beginning of the program. No federal funds were apportioned to the states for the 1948-49 Fiscal Year because, due to a late start by reason of war-end conditions, there was a considerable carryover of funds to bridge the gap. Since no state matching funds were provided for the 1948 and 1950 federal acts, each county was left to its own resources.

Matching Funds

Many counties had adequate road budgets to absorb the unmatched federal funds without difficulty, and others were farsighted enough to augment their road funds by special taxes or transfers from their general funds. Some of the counties chose to relinquish their federal funds to the State for expenditure on the state portion of the Federal-Aid Secondary System in their county. Since the most important objective of the federal-aid program could not be fully accomplished without 100 percent county participation, the legislature removed the obstacle of insufficient matching funds by providing same to the counties in such amounts as to insure the participation of every county. The engineers engaged in administering the Federal-Aid Secondary Program for the State are looking forward, with pleasant anticipation, to renewed contacts with the road commissioners of the counties that have not been in the program during the past few years.

Engineers assisting the district engineers in maintaining contacts with county road commissioners and in supervising district FAS matters are: District I (Eureka), Chas. H. Bowman; II (Redding), Louis Aramayo; III (Marysville), Ted Jain; IV (San Francisco), Fred W. Montell; V (San Luis Obispo), Wm. S. Dolliver; VI (Fresno), Jack G. Sprague; VII (Los Angeles), Mel L. Bauders; VIII (San Bernardino), C. Worth Gaylord; IX (Bishop), F. N. Roberts; X (Stockton), A. L. Tschantz-Hahn and XI (San Diego), Ray L. Beuthel.

Over Quarter Billion Dollars Bidding Capacity Represented at Bid Opening

On JULY 16, 1953, the Division of Highways opened bids in Los Angeles for proposed construction to freeway standards of three miles of U. S. 99 in the San Fernando Valley, between 0.6 of a mile south of the junction of Sepulveda Boulevard and 0.4 of a mile north of the north city limits of Los Angeles. At its northerly end, this work will connect with the recently completed divided highway development through Weldon Canyon.

Fourteen of California's largest contractors submitted bids for this project. The firm of Griffith Company of Los Angeles was the low bidder, submitting a proposal in the amount of $3,060,-396.35.

The other 13 bidders were as follows:

Guy F. Atkinson Co., Long Beach, $3,222,646.25

Webb & White & W. J. Disteli, Los Angeles, $3,243,075.80

Fredericksen & Kasler, Sacramento, $3,261,910.85

Fredrickson & Watson Construction Co. and M. & K Corporation, Oakland, $3,349,790

J. E. Haddock, Ltd., Pasadena, $3,-420,768.40

A. Teichert & Son, Inc., Baldwin Park, $3,446,907

Charles MacClosky Co., L. A. & R. S. Crow and Matich Bros., Los Angeles, $3,449,820

Gordon H. Ball, San Ramon Valley Land Co. & Harms Bros., Berkeley, $3,460,317.42

Peter Kiewit Sons Co., Arcadia, $3,-533,685

Winston Bros. Co., Monrovia, $3,605,-888.25

J. A. Thompson & Son, Inglewood, $3,623,369.55

B. J. Ukropina, T. P. Polich, Steve Kral & John R. Ukropina, San Gabriel, $3,694,521

Stolte, Inc., Oakland, $3,713,341.

This group of bidders indicates the interest shown by the contracting industry in large state highway contracts. It also indicates the competition which develops when projects for larger units of highway construction are advertised for bids and implies the savings in construction costs made possible through such active competition.

Insistent Public Will Get Adequate Roads

Better public understanding of our highway requirements and the people's insistence that the job be done will speed the building of the adequate roads our Country needs, according to Albert Bradley, executive vice president of General Motors and chairman of the National Highway Users Conference.

Mr. Bradley delivered the opening address of a one-day conference of more than 150 representatives of industrial, highway user, farm, business and civic organizations participating in the nation-wide adequate roads movement in Washington, D. C.

Mr. Bradley employed the newspaper world's "who, what, where, why, and how" in analyzing the thinking which led to the launching of the PAR movement 15 months ago.

Banks Given Promotion In Water Resources

State Engineer A. D. Edmonston has announced the appointment of Harvey O. Banks, Sacramento, Supervising Hydraulic Engineer, to be Assistant State Engineer in Charge of Water Rights Administration and Water Quality Investigations to succeed Gordon Zander, retired. He named Leslie C. Jopson to take over the duties of Harrison Smitherum, retired, and to perform additional functions as Principal Hydraulic Engineer in Charge of Water Rights Applications, Watermaster Service, and Water Rights Adjudications. He will be an assistant to the State Engineer on special projects from time to time. Philip J. Coffey will assist Banks in water quality investigations.

Banks was appointed principal hydraulic engineer on February 2, 1952.

EARL WARREN
Governor of California

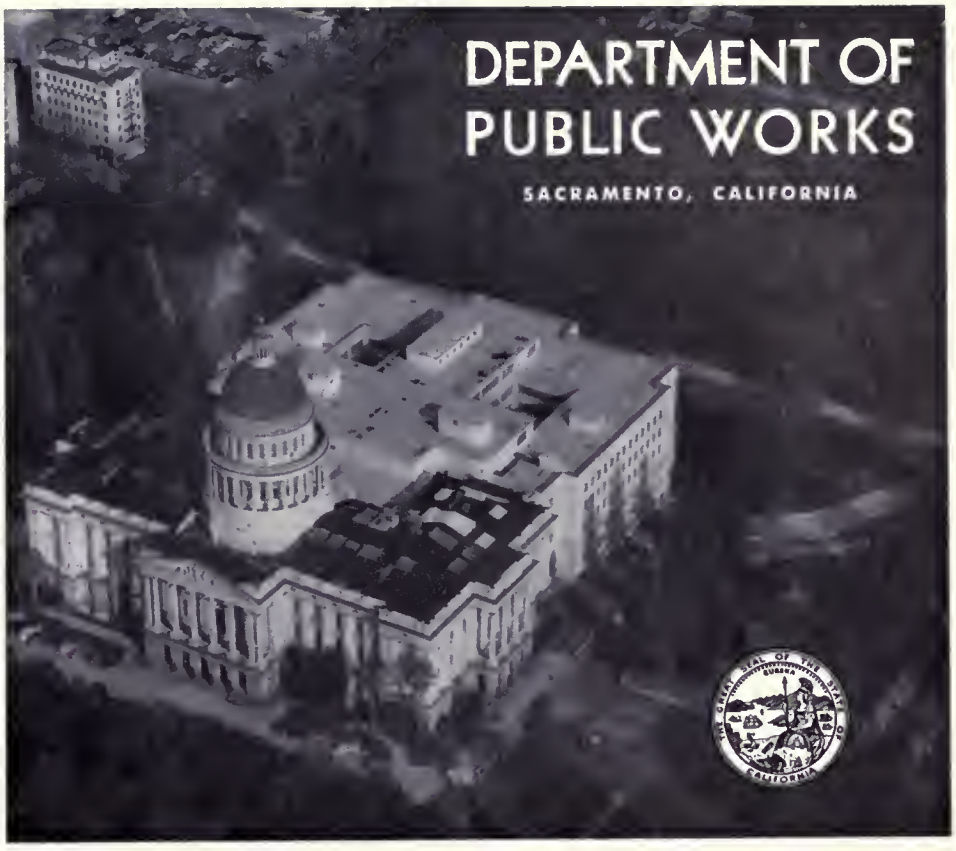
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FRANK B. DURKEE
Director of Public Works

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RUSSELL S. MUNRO
Deputy Director

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Action, adventure, and romance fill the pages of California's last 100 years of history. Human initiative repeats itself again and again through the colorful years of rapid development, but without the great natural wealth of water, soil, forests, mines, and petroleum, the interesting history could never have been written.

Plenty abounded everywhere a century ago, timber for homes and farms, gold in staggering quantities to focus world-wide attention on a then remote frontier, rich soils for productive farms and pasture land, and subsequently, oil to supply energy for mechanized development. And finally, during the most recent 30 years harnessed water and water power to supply cheap electrical energy and to transform vast areas of semi-desert to veritable garden lands of plenty.

To this wealth there was added a temperate climate, recreational opportunities, and scenic beauties of such diverse nature as to have few equals. A haven for home lovers, a mecca for tourists, and a refuge for sportsmen—A Green and Golden California.

There is no state in the Union more dependent on her natural resources. Every drop of water, stick of timber, and blade of grass is needed if we are to meet the challenge of our expanding population.



We cannot meet this challenge if we continue to allow the large number of forest fires to start on our wild lands. Most of those fires start through careless acts by people. It is time to correct those careless habits and to:

Hold your match and feel it before discarding.

Crush out tobacco butts in mineral soil. In autos, use the ash tray.

Drown your campfire; stir it; drown it again.

To burn trash or brush, get a permit from the nearest fire protection officer; then notify him before you start the burning.

KEEP CALIFORNIA GREEN AND GOLDEN

Remember . . .

Only you can PREVENT FOREST FIRES!

State Doc.
NOV 1953

CALIFORNIA
HIGHWAYS AND PUBLIC WORKS



GOODWIN J. KNIGHT, *Governor of California*

SEPTEMBER OCTOBER 1953

California Highways and Public Works

Official Journal of the Division of Highways, Department of Public Works, State of California

KENNETH C. ADAMS, *Editor*
HELEN HALSTED, *Associate Editor*
MERRITT R. NICKERSON, *Chief Photographer*

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KENNETH C. ADAMS, *Editor*
P. O. Box 1499
Sacramento, California

Burns Freeway

First Unit of Arcata Bypass Now Is Under Construction

By H. W. BENEDICT, Resident Engineer

ONE HUNDRED years ago the village of Union Town, now the City of Arcata, had special reason to celebrate. The honor of being named the first county seat of the newly formed Humboldt County had been bestowed upon this frontier town, and in its hands was placed the task of molding the form and substance of a new political body.

Gold was the cry on everyone's lips in that decade, and the back country teemed with men in search of the elusive yellow metal. Enterprising merchants soon learned that these men, though hardy, required food, shelter, and clothing. Arcata, on Humboldt Bay, became a logical focal point where ships from eastern ports could transload their cargoes to mule pack trains bound for the mines. Yet little did the miners realize that this gold boom was transitory and that beneath their feet, in the rich bottom land of the Arcata Delta and in the vast redwood and fir forests through which they trod, lay wealth that only needed development.

Wealth of Natural Resources

Such wealth could not go long unexploited and soon the miner's gold pan was traded for the farmer's plow, and the pick and shovel for the woodsman's axe. A more lasting economy was in the making, an economy that has expanded throughout the years. So sound was this economy that it has insured for Arcata and for Humboldt County an important role in the recent phenomenal growth of California.

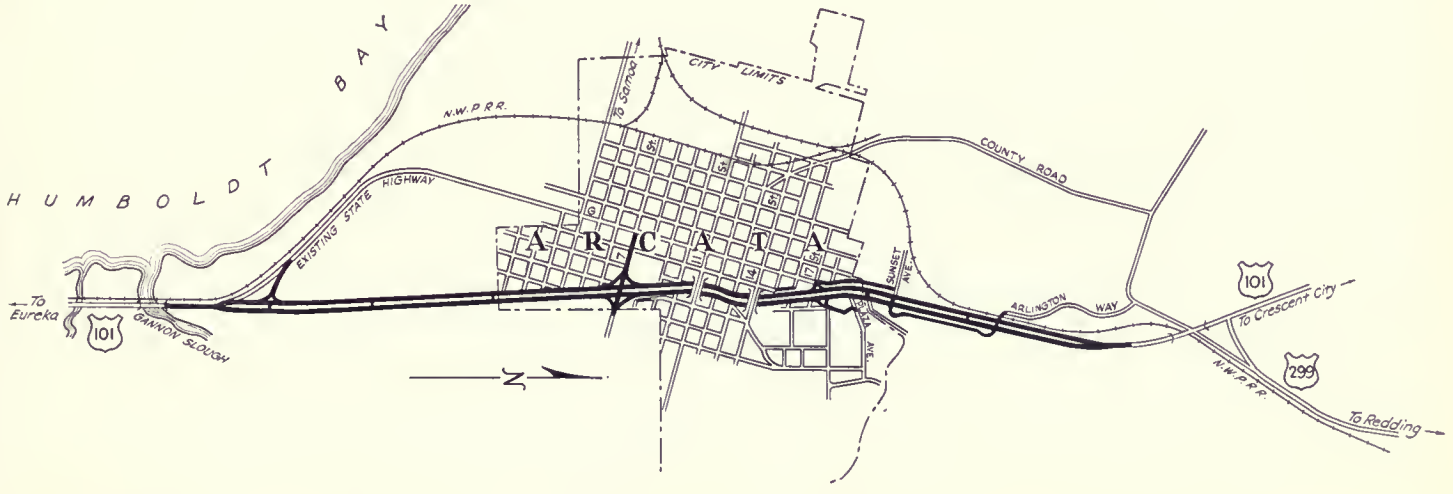
However, as in the rest of the State, such unprecedented growth has brought with it many problems, especially the acute problem of transportation. Oldtimers easily remember roads which were traversable only on horseback during the winter season and can trace the development of the transportation network in the county from these inadequate trails to the present-day hard-surfaced highways.

Yet even these all-weather roads, which would have amazed the early miner and logger, are entirely inadequate for the current mixed traffic of automobiles and trucks that flows in a constant stream over Humboldt's roads each day. Recent traffic counts emphasized this inadequacy by revealing that the portion of the Redwood Highway, Route 101, between Eureka and Arcata was one of the most congested two-lane highways in the State of California.

Senator Burns Honored

Engineers of District I have long recognized the deficiency of this portion of Route 101, particularly the highly congested condition between Eureka and North Arcata, where heavily loaded trucks from U. S. 299 enter the Redwood Highway traffic stream. With the passing of the Collier-Burns Highway Bill in 1947, plans were immediately initiated to supplant this narrow two-lane highway with a modern four-lane expressway. The recent increase in highway user taxes voted by the 1953 California State Legislature gave additional impetus to the planning and insured a much earlier completion of this vital link of Humboldt's transportation network. It is with no little local pride that this link is referred to as the "Burns Freeway," so dedicated by the Legislature in memory of the late revered Michael J. Burns, co-author of the renowned Collier-Burns Highway Bill, and Humboldt County's beloved senator.

It was immediately apparent to the designers that an undertaking of this magnitude would have to be developed in portions. A close review indicated that the project should be logi-





This traffic on U. S. 101 through Arcata will be eliminated by new bypass

cally subdivided into three units and, after study of traffic counts, points of congestion, accident frequency, and financing, they were arranged in order of their importance.

Priority of Projects

First priority was assigned to that portion extending northerly from the Gannon Slough Bridge to 0.90 mile northerly from Plaza Avenue in Arcata; second priority from the north city limits of Eureka to the Gannon Slough Bridge; and third priority to the remaining section from 0.90 mile north from Plaza Avenue to one mile south of the Mad River Bridge. This latter project is to include an overhead structure at a new intersection for the junction of U. S. 101 and U. S. 299.

With this preparatory study out of the way, detailed design was immediately started on the first unit. Surveys, traffic counts, and right of way appraisals began to funnel into the district office, and the dreams of the engineers of District I, as well as thousands of Humboldters, began to find concrete expression.

The location for this particular unit could not economically be justified by widening the present highway, or Main Street of the City of Arcata, as such widening would necessitate obliteration of both a business and a residential district. Fortunately, a gulch or ancient tidal slough extended northerly from the southerly portion of the city nearly to Plaza Avenue, leading to Humboldt State College. The properties in this gulch were largely unimproved and construction of a freeway therein would, in effect, by-pass the city and permit construction of overhead structures crossing the freeway at major street intersections.

Route of Freeway

With this assistance from natural topography, it was logical for the new freeway to depart from the present highway at Gannon Slough, cross agricultural land, enter the gulch on an easy grade, connect with the present highway at Plaza Avenue, and then salvage the existing facility as the westerly two lanes of the freeway to its northerly terminus. An inspection of the accompanying sketch map clearly illustrates the desirability and economy of the location as adopted.

A geometric typical section was selected to provide a four-lane divided highway consisting of four 12-foot traffic lanes, 10-foot outer shoulders and variable inner shoulders. The median will be 22 feet throughout. On the rural portion the inside shoulders will be five feet without curbs. On the urban portion the median will be curbed, with the curbs offset two feet from the inside edges of the pavement.

A structural typical section designed from laboratory tests of basement soils provides for 9 inches of imported subbase material, 8 inches of cement treated base, 2½ inches of dense graded plant-mixed surfacing, and ½ inch of open grade plant-mixed surfacing.

Two Overpass Structures

At this stage in design, it was considered desirable to further subdivide this unit of the freeway into three

contracts for reasons of expediency, orderly construction and for financing. The first of these contracts provided for the construction of two overpass structures to carry local Arcata traffic over the freeway proper. The second contract included grading, drainage, and some surfacing, while the third provides primarily for the surfacing of the new freeway.

Contract 52-1TC7-F for the two overpass structures was awarded to Mercer, Fraser Company, Inc., Eureka, on June 20, 1951. These reinforced girder type concrete structures at 11th and 14th Streets in Arcata were constructed under the direction of the Bridge Department, Division of Highways, represented in the field by Alton F. Kay, resident engineer. On February 25, 1953, all work was completed on these structures at a total cost of $285,769, and local traffic was insured uninterrupted movement while the freeway was being constructed.

On August 5, 1952, work was started on the second and the major grading contract. This was also awarded to Mercer, Fraser Company, Inc., of Eureka, and provides for all grading except that portion of the templet within the existing traveled way; all drainage installation, including storm drain system ranging in size up to 42 inches in diameter; construction and surfacing of two major feeder streets to the grade intersections at 7th and 17th Streets; construction of a frontage road; as well as the myriad of minor contract items such as fencing, guard railing, curbs and sidewalks, monuments, etc.

Interesting Problem

An interesting problem was presented on the southerly 0.9 mile of this contract. The planned alignment in this area crosses, in part, a reclaimed portion of Humboldt Bay, which is actually below high tide elevation and is protected from daily flooding by extensive dikes and floodgates. Several tidal sloughs remained, however, in this reclaimed land which were crossed by the new construction. It was apparent that these sloughs, filled with bay mud as they were, would require extensive preparation to provide a suitable foundation for the new road. To provide this foundation, it was decided to strip the sloughs of unsuitable material, wasting the excavation in a disposal area, and backfilling the holes with imported river gravel. This work, completed during 1952, indicates that such construction is a satisfactory solution to obtaining a stable roadbed.

Work on the contract was carried through the winter season of 1952-53, the contractor utilizing the wet months to install the bulk of the planned drainage system. With the resumption of grading this spring, the bugaboo of District I, subsurface water and unstable slopes, became

Looking south from 11th Street crossing showing cribbing on left. Highway lighting will be installed at intersection in middle distance





Construction on north end of project

evident. The extensive correction work necessary to insure a stable roadway has served to delay the orderly completion of this contract. However, work is rapidly being completed on corrective measures of underdrain systems; concrete crib slope protection; slope flattening; and the removal of unsuitable basement soils.

December Completion Date

It is estimated that, weather permitting, all work on the grading contract will be completed during December, 1953. Latest estimates indicate that the final cost of this contract will be $702,500, exclusive of engineering charges.

On June 18, 1953, the third contract of this unit was awarded to

Start of construction on south end of project



Mercer, Fraser Company, Inc., of Eureka. This contract provides primarily for surfacing the roadbed completed under the grading contract. Also included in the contract is the excavation of portions of the existing traveled way left undisturbed in the previous contract, as well as the usual items of guide posts, curbs, sidewalks, and planting.

Work was started on this contract on July 20, 1953, with the contractor placing imported subbase material on all prepared subgrade. Present plans provide that all work up to the seal coat stage be completed on the southerly 46 percent of the contract mileage this fall. Concurrent with surfacing will be the graveling of all subgrade as rapidly as it is prepared under the grading contract, the intention being to complete an all-weather road to permit construction of curbs during the winter months.

Subgrade Correction

An extensive plan of subgrade correction was also provided for in this contract for that area between 13th and 15th Streets in Arcata, which work, for various reasons, was not provided for under the grading contract. It is in this zone that deep cuts intersected a Franciscan shoreline of rather unusual formation, consisting mainly of gray ocean sands, interspersed with blue clay. Buried in the depths of the excavation were large drift logs and stumps attesting to the age of the formation and to the present gulch once having been a bay slough.

To stabilize this area, an extensive underdrain system will be installed along with extensive stripping of unsuitable basement soil. This stripping will also include the sub-excavation of "honey-pots," so-called local pockets of quicksand ranging in size from a few square feet to several square yards in area.

It is estimated that all work will be completed on this contract in early August, 1954. Current estimates are that the completed contract will involve the expenditure of approximately $546,000.

Public Utilities Involved

Concurrent with the work on the three major contracts has been the difficult reconstruction by the owners of the various public utilities usually necessitated on all urban highway construction. The Pacific Gas and Electric Company and the Pacific Telephone and Telegraph Company have completed the extensive relocation of their respective utilities. The City of Arcata has directed and accomplished the major relocation of water lines and sanitary sewer installations. Presently, only minor adjustments will remain to complete this important phase of the project. Work will soon be started on the signal and lighting contract for control of traffic and illumination of the grade intersections at 7th and 17th Streets.

Work on this portion of the Burns Freeway was initiated under District Engineer A. M. Nash, since transferred to District III, and carried on under the direction of District Engineer C. V. Kane and District I's present District Engineer, Alan S. Hart. District Operations Engineer C. P. Sweet, and E. L. Blomquist, District Construction Engineer, have lent their valuable assistance in solving the various problems of construction. The author is the resident engineer on both the grading and surfacing contracts.

In conclusion, it is pertinent to mention that plans and right of way acquisition are being rushed on the remaining units of the Burns Freeway, with the intent of letting major contracts as funds become available. With this assurance for a rapid completion of a modern four-lane highway northerly from Eureka to beyond a new intersection for U. S. 299, the City of Arcata can celebrate her centennial anniversary this year with the knowledge that the social and economic growth in her second century of life will be given great impetus by the completion of the Burns Freeway.



Bulldozer removing unstable material under bridge on bypass

Scotia Bypass

It Eliminates Point of Traffic Congestion on Redwood Highway

By CHARLES P. SWEET, Assistant District Engineer

Tourists and other motorists traveling the Redwood Highway in Humboldt County in years past have encountered a section of highway through the town of Scotia which was narrow, winding, and, at certain hours of the day, badly conjested by the vehicles of mill workers traveling to and from their work or by trucks hauling logs to the mills and manufactured forest products to market. This condition has now been alleviated through completion on September 15, last, of about one and one-half miles of modern four-lane divided expressway bypassing the town.

In planning the bypass, consideration was given to Scotia being the fourth largest town in Humboldt County and the site of the largest redwood manufacturing concern in the world which makes the town and its mills a well known and advertised tourist attraction for Humboldt County and the Redwood Empire.

Thousands of Tourists

Company records show that each year about 12,000 visitors take advantage of the Pacific Lumber Company's offer of a conducted tour through their plants where, from catwalks installed for their convenience and safety, they can view a modern mill cutting logs and manufacturing lumber. Since publication of Frank J. Taylor's article "Paradise with a Waiting List" in the February 24, 1951, *Saturday Evening Post*, the town of Scotia and the manufacture of lumber from giant *Sequoia sempervirens* have attracted national as well as international attention and company officials feel that in future years the number of tourists viewing their operations will show a marked increase.

To provide for this anticipated influx of additional tourists, the company has widened the centrally located street connecting the town with the bypass expressway and rehabilitated the main thoroughfare of the town. This thoroughfare is the abandoned highway that has so well served the public since it was first paved in 1922 with a portland cement concrete pavement 18 feet in width.

Difficult Clearing Job

The bypass constructed directly back of the town traverses a gently sloping hillside, heavily covered with second growth redwood trees sprouted from stumps of trees that had been cut and logged during the year of 1889. In the area cleared for the expressway, there were over 600 stumps and trees with the stumps varying in diameter up to a maximum of 19 feet. These trees and stumps were removed in cutting and blasting with the resulting debris hauled to disposal sites. Such clearing is difficult and expensive with the cost of this item of work amounting to over $80,000 for the 33½ acres involved.

An unanticipated item of clearing involved the removal of redwood logs and stumps from some 40 feet below the ground surface. It is believed that in years B. C., a major landslide occurred in the hillside now traversed by the new highway and that those redwood trees in the path of the landslide were felled, broken, then covered under tons of earth. These broken boles of trees and upright stumps were uncovered while excavating the major cut on the project with one stump measuring about nine feet in diameter. Considering that stumps of trees 15 feet in diameter had been encountered on the ground surface above the nine-foot stump, one can conjecture that the first-growth of the destroyed portion of the redwood forest started many centuries ago.

It was also interesting to note that the wood in the shattered tree trunks was in a well-preserved condition though the distinctive color of red had been altered by being buried for such a length of time in a wet blue clay.

Roadway excavation, amounting to about 340,000 cubic yards, was removed with either tractor-pulled carryalls or carryalls pulled by rubber-tired equipment with about 177,000 cubic yards being disposed of along the banks of the Eel River. Such a large percentage of excess excavation permitted the utilization of only the driest and most suitable material in the construction of embankments. River gravel, obtained from readily accessible bars in Eel River, was used for subbase material with a designed depth varying from 12 to 18 inches, which depth was increased to a maximum of 24 inches when wet plastic soils were encountered in cut section.

Experience has shown that in this section of California where rains of varying intensity may be anticipated during the period from October to May, the resulting saturated condition of the ground necessitates adequate drainage of embankment foundations to insure immediate as well as future stability of the highway. This desirable condition is attempted and usually obtained by removing the top soil within the foundation area and placing a blanket of gravel over the exposed underlying soil. As such foundation treatment is difficult to estimate during the planning of a project, an increase in the items of work involved may be anticipated during the progress of the work, with this project being no exception. Additional embankment stabilization, backfill of unsuitable subgrade excavation and increased depths of subbase over poor subgrade required an increase of nearly 28,000 tons to the estimated quantity of 85,000 tons of river gravel subbase material.

Hillside Stability Problem

Prior to the severe storm period of the 1952-1953 winter season, the stability of the hillside within the ancient slide area above the town caused considerable concern as a heavy sur-



UPPER—Slide area on Scotio Bypass which has been stabilized. LOWER—South end of project looking north showing connection to old highway south of Scotia.



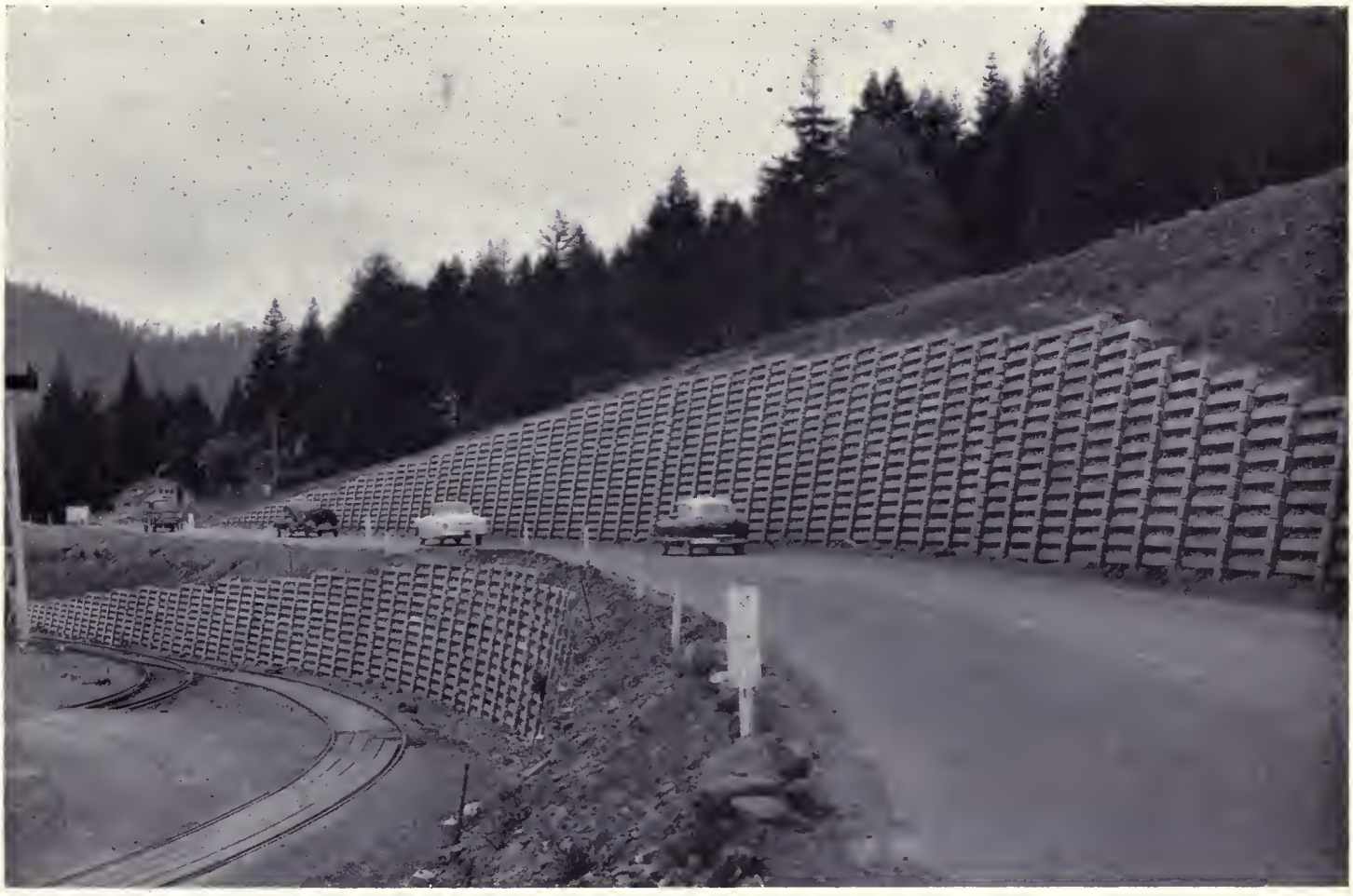
UPPER—Bypass undercrossing shawing on-ramp underpass and off-ramp at narth end af project. LOWER—Freeway looking north—Scotia Bridge in distance.



charge consisting of two 250,000-gallon water tanks was located about 200 feet from the centerline. These water tanks are a part of the Scotia water supply system and obviously any damage to these tanks from either settlement or sliding would become a serious problem and constitute a costly repair project. In collaboration with the Materials and Research Department, 23 horizontal drains were drilled into the hillside below and under the water tanks with a McCarthy rock-boring machine equipped with a continuous flight auger. A maximum initial flow of 18,000 gallons per day was obtained in one drain with about 5,800 gallons per day flowing from all drains during a relatively dry period during the winter season. It was estimated that this flow increased from three to four times during periods of heavy rainfall. Though slides have occurred in the hillside above the new highway in the vicinity of the water tanks, the horizontal drains placed at a nominal expenditure of $4,950 have prevented any slides occurring in the area drained by the installation.

Extensive Crib Structure

A company-owned railroad, hotel and other improvement at the northerly end of the town imposed horizontal restrictions on the location and design of a suitable intersection for traffic entering or leaving Scotia, and a transition from a four- to a two-lane pavement to fit the two-lane north Scotia Bridge. It was therefore necessary to resort to construction of an extensive structure of reinforced concrete crib members to restrain the freeway embankment and permit the construction of an off-ramp embankment without encroaching onto the bed of the adjacent railroad. A reinforced concrete underpass was constructed below the freeway for the on-ramp. The completed transition and grade intersection, to be lighted under a separate contract, provides a pleasing and attractive appearance within a restricted area and should show a minimum of accidents over the years because of its advanced design.



Reinforced concrete cribs north of Scotia

Superintendent William J. Rowland ably represented Contractor Fredrickson and Brothers in prosecuting the work which was supervised for the State by District Engineer Alan S. Hart and Resident Engineer H. M. Hansen during 1951 and 1952 and Resident Engineer E. J. Reed, Jr., during 1953.

San Rafael Freeway

San Quentin Wye Structure Eliminates Traffic Hazards

By E. J. CARTER, Resident Engineer

SINCE ITS INITIAL construction in 1929, the section of state highway Route U. S. 101, between the San Rafael Viaduct and the California Park Overhead in Marin County has been the scene of rapid growth. Constant increase in traffic has required almost continual expansion of the highway facilities.

In 1941 this section was widened to four lanes with a four-foot dividing strip and the construction of frontage roads. Continued increase in daily traffic (31,600 ADT, March, 52) and the increased congestion at the San Quentin Wye intersection near the California Park Overhead warranted reconstruction to full freeway standards.

This section being located over swampy lands adjacent to an arm of San Francisco Bay had continually settled and required restoration of grade to maintain a profile above high tides.

Alter Frontage Roads

During periods of high tides and heavy runoff from winter rains the frontage roads were frequently inundated making travel thereon slow and hazardous and the cause of many complaints.

On this project the existing frontage roads are being raised and moved outward from the highway to pro-

Construction of overcrossing looking northwest toward San Rafael





Looking south on U. S. 101 toward new overcrossing at San Quentin Wye



Aerial view of San Quentin Wye separation structure

vide standard two-lane two-way roads for service to business properties, and the freeway is being reconstructed to six lanes with a 12-foot raised bar median strip and physically separated from the frontage roads by a four-foot chain link fence. The frontage roads are looped together under the existing railroad overhead at California Park. This provision, together with the already existing local road undercrossing at the San Rafael Viaduct, permits complete freedom and interchange of traffic between the business sections on either side of the freeway for the one-mile length of the business district.

Separation Structure

The existing grade intersection at the San Quentin Wye will be eliminated by construction of an 1,100-foot reinforced concrete box girder separation structure which will carry Richmond-bound traffic to the left over opposing northbound traffic.

The overcrossing consists of two 190-foot abutment sections and 11 box girder spans supported on rectangular single column bents. The structure sweeping gracefully in gentle reversing curves as it carries Richmond-bound traffic above all surface interference bringing it down onto the almost parallel route to the left, presents a very pleasing appearance. The grace and simplicity afforded by the long spans and the slender single column piers does not screen off the roadside establishments.

Completion of this project, scheduled for late in October, will provide the primary traffic interchange between the Richmond-San Rafael bridge, which is now under construction, and the Redwood Highway. Freeway construction on the Redwood Highway now totals approximately 19+ miles between the California Park Overhead south of San Rafael and Petaluma.

The project is being financed from state highway gas tax funds and federal aid funds and is under the general supervision of Assistant State Highway Engineer, B. W. Booker; E. J. Carter is the resident Engineer.

The work of reconstructing the Waldo Grade to freeway standards is scheduled for completion in 1955. Plans are being developed which will provide modern traffic interchanges to replace the three remaining signalized intersections beween San Rafael and the Golden Gate Bridge. The ultimate completed program will render the highest type of automotive traffic service to the North Bay communities and will provide excellent through traffic facilities for Redwood Empire commerce.

Bids were opened in Sacramento on September 12, 1951, for a freeway project between Myrtle Avenue and the California Park Overhead in Marin County, a distance of approximately two miles.

The contract was awarded to the low bidder, a joint venture combination of A. G. Raisch Co. of San Rafael and the Lew Jones Construction Co. of San Jose on September 21, 1951.

VETERAN STATE EMPLOYEES GET SERVICE PINS

Anson Boyd, State Architect, on September 11, presented Twenty Five Years of Service Certificates and lapel pins to the following members of the Division of Architecture:

Merle A. Ewing, Principal Structural Engineer;
Clifford L. Iverson, Chief Architectural Draftsman;
O. E. Anderson, Supervising Mechonical and Electrical Engineer;
Albert Keating, Supervising Architectural Draftsman;
Frank J. Chon, Structural Engineering Associate;
Mrs. Katherine E. Zarzana, Intermediate Typist-clerk.

Ewing, Principal Structural Engineer, is in charge of the Sacramento office of the Schoolhouse Section of the Division of Architecture, responsible directly to the Chief Construction Engineer, and through him, to the State Architect. The Schoolhouse Section is responsible for the structural checking of all public school building plans in the Central Valley area of the State, extending from Porterville on the south to the Oregon border on the north.

Iverson, Chief Architectural Draftsman, has been with the State of California over 25 years, and during that period of time has seen the drafting room of the division grow from only a very few people to an organization now in excess of 300 draftsmen. He is responsible for all architectural drafting, and the coordination of architectural drawings in their final stages with the work of the specialist sections such as mechanical engineering, electrical engineering, structural, etc.

Anderson, Supervising Mechanical and Electrical Engineer, is in charge of the mechanical engineering function of the division in Northern California, which embodies that portion of the State lying north of the line of the Tehachapi Mountains. He is a Principal Assistant under Carl Henderlong, Principal Mechanical and Electrical Engineer.

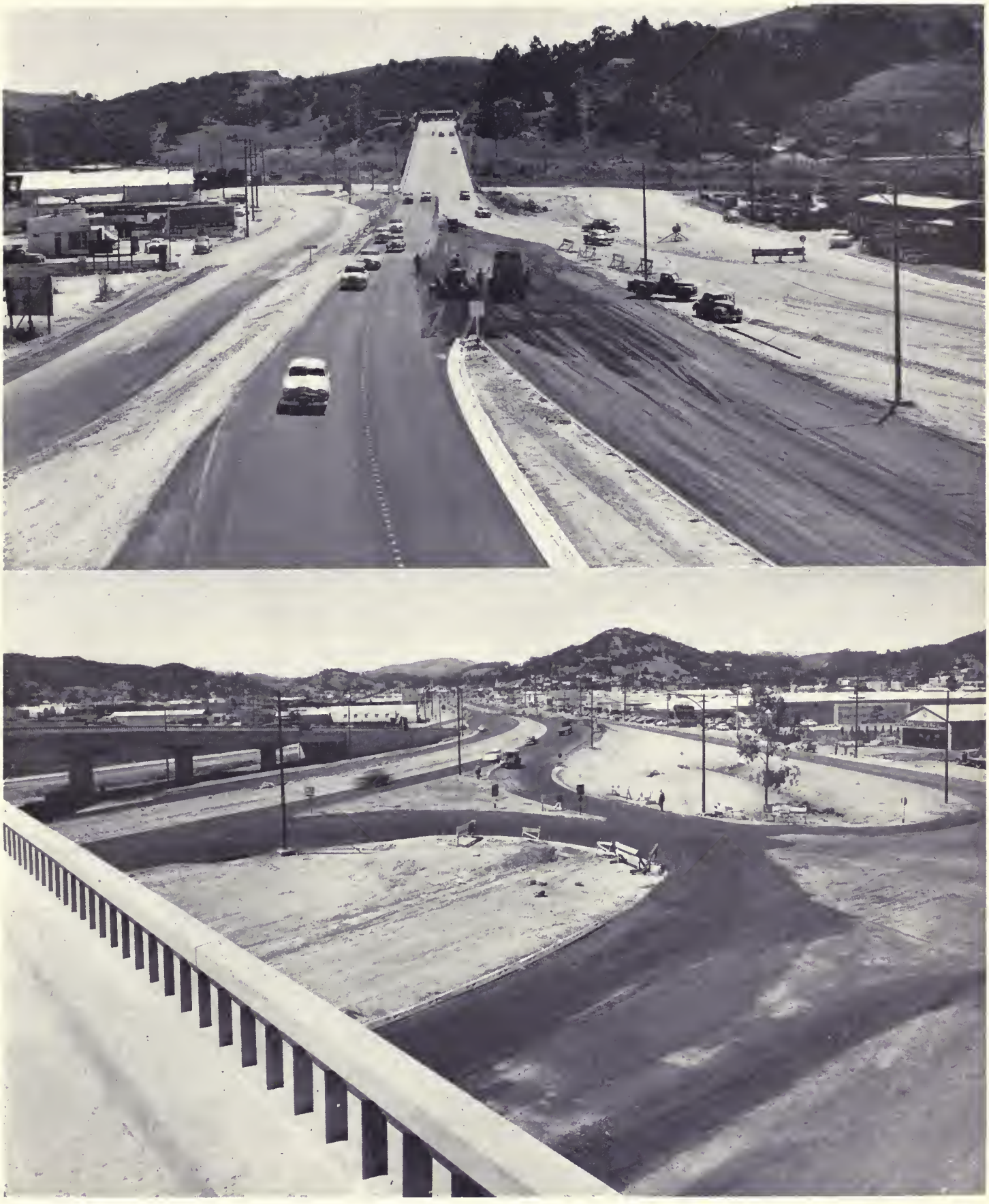
Keating, Supervising Architectural Draftsman, is Iverson's Principal Assistant, and is in direct supervision of the approximately 250 architectural draftsmen located in the Sacramento office.

Chan, Structural Engineering Associate, is employed in the Structural Engineering Section of the Division of Architecture's Sacramento office.

Mrs. Katherine E. Zarzana is employed in the Contract Section of the division, and her entire state career has been in the same position. Through her long service with the State she is responsible for the actual preparation of construction contracts for all projects throughout the State of California, and is Carleton Pierson's confidential assistant. Pierson heads up the Contracts Section for the State Architect.

CAREFUL DRIVERS

You may be a careful driver, but are you careful enough to allow for the possible carelessness of the other driver? By keeping speed down to such levels as to allow complete control of your car in any emergency, you can help save a life, possibly your own.



UPPER—Looking south from overcrossing toward San Francisco. LOWER—Construction looking north from seporotion structure toward San Rafael.

Ground Breaking

Largest Single Highway Contract Undertaken on Waldo Approach

START of construction on the Golden Gate Freeway approach in Marin County, a seven-million-dollar project, was observed with ground-breaking ceremonies near the south entrance of the Waldo Tunnel on September 22d.

Led by Director of Public Works Frank B. Durkee, engineers on the staff of State Highway Engineer George T. McCoy, and Highway Commissioner Walter Sandelin of Ukiah, joined with officials of the U. S. Bureau of Public Roads, the U. S. Forest Service, supervisors and state legislators of Redwood Empire counties, ranking officers of the Army and Navy, officials of San Francisco and Sausalito, representatives of the Sausalito Chamber of Commerce, the Redwood Empire Association and the Golden Gate Bridge and Highway District in celebrating the occasion. The official ground breaking and a luncheon at the Alta Mira Hotel in Sausalito was staged under the direction of Clyde Edmondson, general manager of the association.

Biggest Highway Contract

The Golden Gate Bridge and Highway District was responsible for negotiating a five-million-dollar loan of state funds for the project. The initial contract in the amount of $4,122,382, which got under way on September 22d, is the largest ever let on the California State Highway System. The contractor is Guy F. Atkinson Company, South San Francisco.

Clifford Bartlett, Marin County, vice president for the Redwood Empire Association, served as master of ceremonies after Lee H. McLeod, president of the association, officially welcomed guests.

Joseph Diviny, president of the Golden Gate Bridge and Highway District, had a seat of honor on the bulldozer which turned over the first earth.

Speakers at the official ground breaking included State Highway Engineer McCoy, Congressman William S. Mailliard, San Francisco; Highway Commissioner Sandelin, E. E. Safford, Willits, president of the Redwood Empire supervisors unit; Arthur J. Schilder, Ukiah, association executive board member and past president; Sylvester J. McAtee, mayor of Sausalito; and Shirley Morgan, president of the Sausalito Chamber of Commerce.



HIGHWAY COMMISSIONER WALTER SANDELIN

Durkee Principal Speaker

Public Works Director Durkee and George P. Anderson, of the Golden Gate Bridge and Highway District, were the principal speakers at the luncheon at which the guest list included Dan Gallagher, sheriff of San Francisco, representing Mayor Elmer E. Robinson; William D. Fusselman, chairman of the Marin County Board of Supervisors; Rear Admiral John R. Redman, representing Vice Admiral F. S. Low, deputy commander for the Western Sea Frontier and Pacific Reserve Fleet; Lt. Col. Edward Maguire, representing Lt. General James Swing, commanding general of the Sixth Army.

State Highway Engineer McCoy took pleasure in attending the ceremonies for more than one reason. His son, George T. McCoy, Jr., 33, is general superintendent for the contractor on the $4,122,382 job.

Record Contract

The Atkinson bid established an all-time high for a single highway project in the State. Previous record-holder was the five-mile extension of the Bayshore Freeway from San Mateo to San Carlos, for which a $3,749,142 contract was awarded recently.

Eight firms submitted bids to the Division of Highways on the Waldo job, which also claims another record for the highest number of construction items ever contained in a state highway contract. The bid form for the Waldo project lists 142 separate items to be performed by the contractor.

In addition to reconstructing the existing four-lane highway as a divided, six-lane freeway, the project also includes the construction of a 1,000-foot-long highway tunnel, two side-hill viaducts each approximately 300 feet long, an overcrossing, an undercrossing, extension of two existing undercrossings and extension of the military tunnel that passes under the freeway in the Fort Baker area just north of the Golden Gate Bridge.

Two Roadways

The existing highway will be converted to a three-lane roadway for southbound traffic. An additional three lanes will be constructed for northbound traffic along the east side of the present road except for a half mile section just north of Monte Mar Drive in Sausalito where the new roadway will lie along the west side of the existing highway. The two roadways will be divided throughout by a curbed median strip.

The new highway tunnel will be 1,000 feet long and lined with rein-





UPPER—On deck of groundbreaking bulldozer. LEFT TO RIGHT—Director of Public Works Frank B. Durkee, Joseph Diviny, President, Golden Gate Bridge and Highway District; Highway Commissioner, Walter Sandelin, State Highway Engineer, George T. McCoy, Lee H. McLeod. LOWER—Bulldozer breaks ground.

forced concrete. It will provide a clear roadway width of 40 feet and will be located parallel to and east of the existing Waldo Tunnel to accommodate northbound traffic.

The two sidehill viaducts will be situated just north of the new tunnel. They will be reinforced concrete girder structures and each will provide a clear roadway width of 40 feet.

Traffic Interchange

A traffic interchange will be constructed near the summit of the Waldo Grade to serve traffic to and from Sausalito. Because of the steepness of the terrain this interchange will require a 314-foot bridge to carry traffic over the freeway at Spencer Avenue, as well as an undercrossing about midway between Spencer Avenue and Monte Mar Drive.

The long military tunnel passing under the highway in the Fort Baker

area will be extended 108 feet to the east.

In addition, the existing interchanges at the Sausalito lateral and at Marin City will be extended to handle the roadway for northbound traffic.

Execution of the work is planned in two stages. The contract to be awarded on the basis of the bids just opened will take care of the grading and structures, including the tunnel, and those portions of the base and surfacing required for the convenience of traffic, and is expected to be completed by the end of 1954.

Second Contract Planned

When the first contract is completed, a second contract will be let to take care of the remaining base and surfacing, the median strip between the two roadways and other incidental installations.

The project will be financed largely from Golden Gate Bridge toll funds. A recent legislative act authorized the Golden Gate Bridge and Highway District to advance approximately $5,000,000 against future bridge toll revenues. The remaining funds will be provided from state highway revenue.

This section of U. S. 101 was declared a freeway by the California Highway Commission in May, 1947. Freeway agreements were executed with Marin County and the City of Sausalito in April of this year.

Right of way is being acquired on a full freeway basis throughout. This will result in only four vehicular entrances within the limits of the project, all by means of traffic interchanges.

Recent traffic counts show that this section of U. S. 101 is presently carrying more than 25,000 vehicles a day.



Attractive Mrs. Ann Jackson of San Rafael, Junior Engineer in office of Assistant State Highway Engineer B. W. Booker, poses with Earl Withcombe, Assistant State Highway Engineer (Construction), left, and State Highwoy Engineer George T. McCoy. Mrs. Jackson, honor graduate in engineering, University of Utah, '51, is in the field office, Division of Highways, on the Waldo project.

"LITTERBUG"

"Litterbug" is the term now being applied to motorists who leave trash at picnic spots, dispose of cans or waste by tossing it along the side of the road, and otherwise deface the countryside. The California State Automobile Association is urging motorists to carry a paper bag in the car for accumulated trash. Then it can be disposed of properly during or at the end of the trip, instead of being littered along the roadsides.

SCHOOL USES MAGAZINE

RANCHITO SCHOOL DISTRICT

Mr. Kenneth Adams, *Editor*

Dear Mr. Adams: Although the children I teach are only fourth graders, we get much information from your magazine that we can use in our study of California.

Each time the magazine comes I feel fortunate to be able to have such a fine, well written, publication.

Mrs. Dorothy Pomeroy
(Fourth Grade Teacher)

"FOLLOW THE LEADER"

Don't play "follow the leader" in traffic, advises the National Automobile Club. Just because the other fellow slipped through that stop sign or cut in on that other car is no indication that you can do so safely. When you indulge in such tricks, you are taking those long chances that lead to a short life.

Tough Survey

Old Bridgeport Wagon Road Will Finally Be Made Highway

By J. H. CREED, District Design Engineer

EIGHTY-ODD years ago, the residents of Bridgeport Valley in Mono County constructed a wagon road of sorts down the East Walker River to Smith Valley in Nevada. It followed the line of least resistance, hugging the narrow benches along the river and meandering across the flats according to the whim of the roadbuilder. Some thought was given to keeping it with a south exposure on account of snow conditions, and this condition, together with the avoidance of heavy grading, dictated two crossings of the river.

At that time, the river varied from a brawling torrent running several thousand second-feet in the late spring, to a medium-sized creek in the late summer, fall and winter. Bridging it must have presented some problems, but the early settlers of the area were a hardy lot.

Relocated in 1923

Small changes in the road were made from time to time, and in 1923, the first five miles out of Bridgeport were relocated to get above the flood line of the East Walker River Reservoir, the dam for which was completed that year. With the exception of this change, the location of the road seems to have been stabilized at its present position by 1880. Government land survey notes of that date show it to be practically in the same place as it is today.

In 1933, the road was taken into the State Highway System, and all 13 miles of it began to have a face lifting of sorts.

Maintenance Casts High

The first five miles from Bridgeport to the dam is in rather easy rolling country, and was rebuilt to reasonable standards. The next eight miles is through more rugged country, and the cost of rebuilding could not be financed. A very minor improvement project was done to get a two-way roadway, and the local material was oiled. Due to low grade line, poor drainage and lack of good base or surfacing, the maintenance cost is prohibitive, involving annual reworking of the surfacing and extensive shoulder repair and other operations.

In Nevada, a modern highway has been constructed right up to the state line, and the contrast between it and the California road is unfavorable. An average speed from the Nevada line



Section of cleared line. This is typical of terrain through which survey was made.



UPPER—East Walker River. LOWER—Beaver dams flood survey line.

to the dam of over 25 miles per hour involves considerable reckless driving.

New Highway Design

With all these factors in mind, a project to rebuild this portion was included in the 1952 planning program and surveys were started. Due to the regulation of the river, it is now possible to take advantage of the old overflow flats, and a design is being worked up which will make a safe over-all driving speed of 50 miles per hour possible. This will halve the present driving time and make a vast improvement in the comfort and safety of the trip.

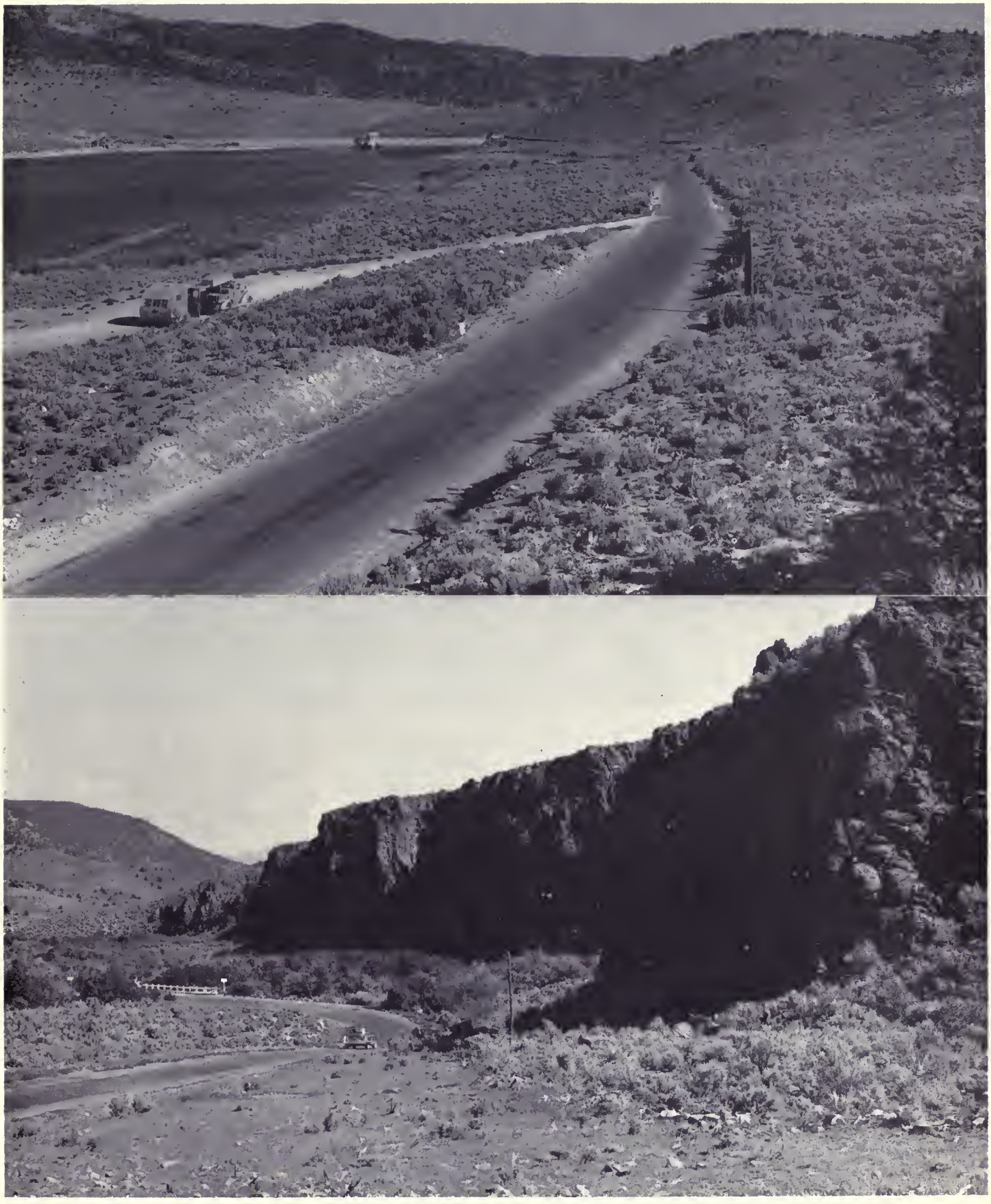
At present, the travel on this route is rather light but it is by far the most direct connection between Yerington, Nevada, and Southern California, and when improved will undoubtedly attract a greatly increased volume of traffic.

Survey Problems

Surveying the line has presented many difficulties. Much of the work has involved cutting through brush so thick that even the snakes are reputed to go around it. At one location, the beavers have persisted in building dams in the overflow channels, and flooding the line. The river generally carries around 600 second-feet of water in a steep, boulder-

. . . Continued on page 51





UPPER—This was the beginning of the survey. LOWER—Section of existing pioneer road.

Beckwourth Pass

Story of Old Road Told in Discoverer's Own Words

By H. CLYDE AMESBURY, District Traffic Engineer

THIS YEAR the Division of Highways completed an improvement on U. S. Route 24 extending from the Susanville-Reno Highway about 4¼ miles to the west. This includes most of the section through Beckwourth Pass.

With this completed improvement of Beckwourth Pass, one of the worst bottlenecks on the Feather River Highway, especially for truck traffic, will be removed.

The original highway, which is replaced, was never built to planned standards. It had a surface of about 20 feet in width. There was one grade crossing of the Western Pacific Railroad and several abrupt short radius curves. Grades were up to 12 percent. It was on the north slope of the hill near the bottom of the pass. In the winter storms, snow blew in and lodged. It was very difficult for the maintenance department to keep the road open during snow storms when accompanied by high winds. There was no place to buck the snow.

The new location is on the same side of the pass but higher on the slope. In place of the numerous curves there are only two. These are of long radius. The roadbed is 32 feet wide. The railroad is crossed by an overpass. The steepest grade is 6 percent.

Due to the wider roadbed and the improved alignment, the trouble with snow removal will be greatly reduced. There are both storage space for snow and a chance to shove it over the side.

This contract was performed for the Division of Highways by Eaton and Smith. J. W. Trask is district engineer at Redding, in which district the work is located. Ray Huck was resident engineer.

The Beckwourth Pass project has long been desired by all the towns in the Feather River area, including Oroville. It will unquestionably make the Feather River Route safer and easier to travel for trans-Sierra traffic.

Beckwourth Pass! What a name that was to conjure with in the 1850 to 1860 era. It was the northern route by which the hardy and trail-worn immigrants could reach the Feather River gold mines and the upper Sacramento River Valley.

When they reached this point, after the long dry trip through Nevada, they knew that in some ways at least there were better times ahead. There would be water, horse feed and game. They were on the Pacific Slope. It wasn't an accident that the place where they turned west off the Reno-Susanville road was called Hallelujah Junction.

"The Smiling Pioneer"

The pass got its name from its discoverer, James P. Beckwourth. From his own story, "The Smiling Pioneer," he tells of its discovery.

He landed in San Francisco in 1848. He was about 50 years old and had crammed more adventures in trading, living with and sometimes fighting Indians, than would fill the lives of a score of ordinary men. He had been in the Northwest when he was adopted by the Crows and became a chief. He had been in the Spanish Southwest. Always, he tried to keep his relations with the Indians on a friendly basis. His success was phenomenal.

Beckwourth's Story

But now listen to Jim:

"The next spring (1849) I engaged in mining and prospecting in various parts of the gold region. I advanced as far as the American Valley (Quincy) having one man in my company, and proceeded north into the Pitt River country, where we had slight difficulty with the Indians.

"While on this excursion, I discovered what is now know as Beckwourth Pass in the Sierra Nevada. From some of the elevations over which we passed, I remarked a place far away to the southward that seemed lower than any other. I made no mention to my companion but thought at some future time, I would examine it further. I continued onto Shasta with my fellow traveler, and returned after a fruitless journey of 18 days."

The Shasta referred to is the town situated some seven miles west of Redding. At that time it was one of the three largest towns in the State. We do not know what route he took but the round trip must have covered between five and six hundred miles through the mountains.

Returned in 1850

Next spring (1850) he came back and made further exploration, approaching the pass from the west side.

"It was the latter part of April when we entered upon an extensive valley on the northwest extremity of the Sierra range. The valley was already robed in freshest verdure contrasting most delightfully with the huge snow-clad masses of rocks we had just left. Flowers of every variety and hue spread their variegated charms before us; magpies were chattering, and gorgeously plumaged birds were caroling in the delights of unmolested solitude. Swarms of wild geese and ducks were swimming on the surface of the cool crystal stream, which was the central fork of the Rio de las Plumas (Feather River), or sailed in the air in clouds over our heads. Deer and antelope filled the plains, and their boldness was conclusive that the hunter's rifle was unknown. Nowhere visible were any traces of the white man's approach, and it is probable that our steps were the first ever marked the spot. We struck across this beautiful valley to the headwaters of the Trucky (Truckee) which flowed in an easterly direction, telling us we were on



Beckwourth Pass—Looking east from near west end of project. New highway on right; old one on left. LOWER—Looking west from Hallelujah Junction.

the eastern slope of the mountain range.

Plan Road Into Valley

"This I at once saw would afford the best wagon road into the American Valley approaching from the eastward, and I imparted my news to three of my companions in whose judgment I placed the most confidence. They thought highly of the discovery and even proposed to associate with me in opening the road. We also found gold but not in sufficient quantities to warrant our working it; and furthermore, the ground was too wet to admit of our prospecting to any advantage.

"On my return to American Valley, I made know my discovery to

. . . Continued on page 55



Camarillo Expressway

Grade Separated From S. P. Line

By RAY A. COLLINS, Associate Highway Engineer, and
F. B. DONOVAN, Associate Bridge Engineer

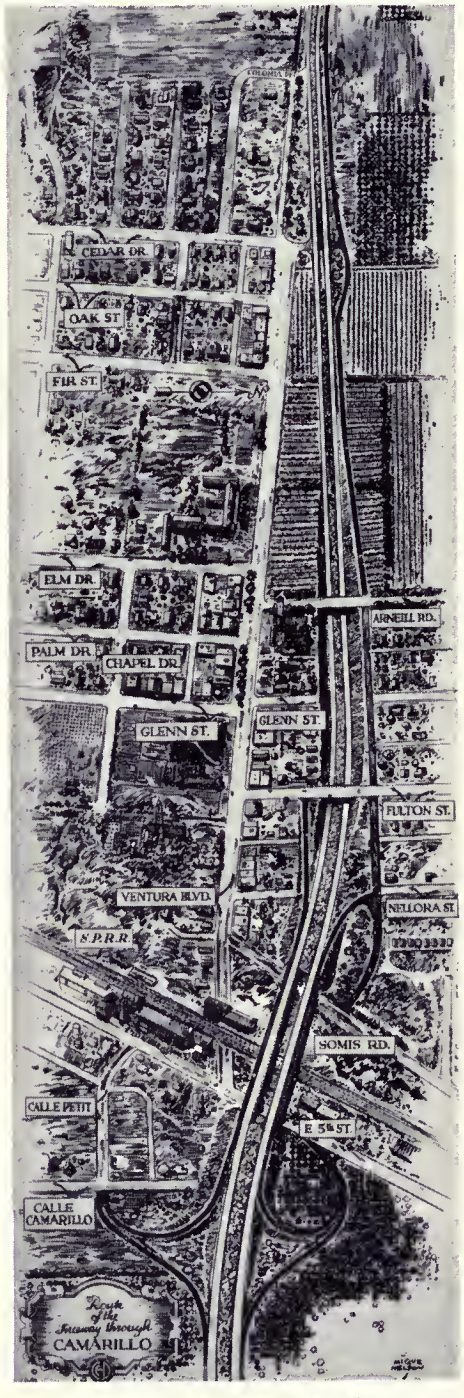
(Editor's Note: With two contracts running simultaneously, one for the railroad grade separation bridge structure and the other for highway construction both sides thereof over a length of 5.7 miles, Mr. Donovan as resident engineer for bridge structures and Mr. Collins as resident engineer on the highway construction have been asked to collaborate in reporting this freeway project.)

WHEN THE freeway at Camarillo, a $3,000,000 project, is completed next spring and opened to public traffic, the last remaining main line railroad grade crossing on U. S. 101 between San Diego and San Francisco will have been eliminated. Finding the satisfactory solution to the problem at Camarillo of doing away with the conflict between highway traffic and railroad trains required detailed studies of many alternatives.

Problem of Railroad Facilities

The problem was complicated by extensive railroad facilities and the fact that any widening improvement carried out upon the existing state highway alignment would have resulted in destroying practically the entire business district of the town of Camarillo. Various possible locations were investigated, some involving highway subways under the railroad as well as highway bridges over the railroad. The solution finally adopted was for a by-pass of the business district on the northerly side of the existing state highway. The adopted relocation was the most economical in money expenditure and also caused the least possible disturbance to the town.

The clearing of the right of way for the Camarillo Freeway construction involved the moving or demolition of 51 homes and other buildings. The most important moving job was in connection with the reconstruction of the facilities of the Southern Pacific Railroad. The railroad station building had to be moved in two stages, it being impossible to move it immediately to the final location. This building was first moved just sufficiently to clear the grade separation bridge structure where it will remain for several months longer.



Sketch of project by Mique Nelson

Right of Way Costs

After the new freeway is entirely completed and opened to public traffic, the old highway right of way and pavement can then be abandoned and the Southern Pacific station building will be moved to its permanent location on the old highway right of way. This situation is portrayed on the accompanying bird's-eye sketch map prepared by Mique Nelson of the District VII staff. The total cost of right of way acquisition on this project was $1,000,000.

The highway contract is being carried out by the Griffith Company of Los Angeles. Construction was started on May 13, 1953. Joe Porcher is project manager, Kinny Kinnamon is project superintendent, and Carl McCracken is structures superintendent for the Griffith Company. The construction provides for a four-lane divided expressway to replace existing Ventura Boulevard, known locally as the Old Conejo Road, from Calleguas Road through the town of Camarillo to a point 0.4 mile west of Central Avenue, a distance of 5.7 miles. It includes the construction of a reinforced concrete bridge across Calleguas Creek, and reinforced concrete bridges carrying Fulton Street and Arneill Road in Camarillo across the freeway.

The Arroyo Calleguas Bridge, to carry two lanes of eastbound traffic, will consist of two 35-foot end spans and a central span of 60 feet. The Fulton Street Overcrossing and the Arneill Road Overcrossing will both consist of two spans each of 60.75 feet. The Arroyo Calleguas Bridge is

supported on cast-in-drilled-hole concrete piling and the two overcrossings are supported on spread footings. There are among the contract items 1,600 lineal feet of reinforced concrete box culverts, 5,500 feet of reinforced concrete pipe storm drains and 2,000 feet of corrugated metal pipe. The total of the contract allotment is $1,243,600.

Roadway Design

The main roadway is a four-inch plant-mixed asphalt surface laid on six inches of cement-treated select material which in turn is supported by six inches of select material on the subgrade. There are north and south frontage roads 24 feet wide for a large part of the job. On these a two-inch plant-mixed asphalt surface is laid on six inches of select material. A large portion of the westbound roadway is formed by resurfacing and widening the existing pavement.

The 300,000 cubic yards of roadway excavation and the 155,000 cubic yards of imported borrow were excavated and placed by three 15-yard Carryalls, three 15-yard Tournapulls and three 18-yard DW21 Caterpillar scrapers. On some days this equipment moved 8,000 cubic yards. Progress in general is very good. By the end of the third month the job has recovered from a late start and is now running ahead of schedule.

Except at the approaches to the Southern Pacific overhead and separation the fills were less than three feet to subgrade. Since a large part of the new location was through fields that had been cultivated and irrigated for several generations, it was necessary to compact the original ground. Relative compactions of 65 to 75 were increased to over 90 by watering and rolling with a sheepsfoot roller. One unusual feature was



Looking westerly along freeway location where crossing is made with main line Southern Pacific Railroad showing construction in progress on Camarillo Overhead. At extreme left will be seen the Southern Pacific Railroad station building in its temporary location.



UPPER—View laaking easterly along Camarillo Freeway from near Fultan Street showing grading aperations in pragress. In backgraund is Camarillo Overhead.
LOWER—View laaking southeasterly taward Camarillo Overhead structure shawing contractar's batching plant in center left of photograph.



that the roadway excavation of the deep cut through Camarillo supplied very nearly all of the select material. This was of exceptionally good quality.

Camarillo Overhead

The Camarillo Overhead and Separation structure is being constructed under a contract awarded to Peterson and Baker of Los Angeles. Jack Baker is project manager and Fred Falk is structures superintendent. The total contract allotment is $565,000.

The Camarillo Overhead and Separation will consist of two parallel bridges, each 578 feet in length and each providing a clear roadway of 40 feet. This 40 feet will provide two lanes of unidirectional traffic plus provision for acceleration and deceleration lanes for the on and off ramps. Bent footings are supported by 468 cast-in-drilled-hole concrete piling and abutments are on 10BP42 steel piling.

The erection of this structure will remove another railroad grade crossing from the state highway system and also facilitate cross traffic along Route 153 from Somis Valley to coastal points. The existing railroad grade crossing has long been a thorn



Looking easterly along U. S. 101 showing congestion while traffic is held up by the Southern Pacific Railroad

in the side of the local citizenry and the travelers on U. S. 101. Route 153 northerly to Somis is on the west side of the Southern Pacific Railroad tracks and Route 153 southerly to Oxnard is on the east side of the tracks. Therefore under existing conditions it is necessary for Route 153 traffic to blend with U. S. 101 traffic while crossing the railroad tracks. In addition to this difficult highway traffic situation, the Camarillo switch track of the Southern Pacific Railroad is used frequently to by-pass freight trains on the main line and also to clear local and through passenger

View looking westerly along Camarillo Freeway from near Arneill Road showing grading operations in progress. Existing state highway shown on left with frontage road and housing development operations on right.



trains. Traffic on both U. S. 101 and Route 153 is thus frequently stopped completely for considerable periods throughout the day and night. It is not at all unusual to see upward of 100 cars and trucks tied up on each side of the tracks. This crossing has also been the scene of several fatal auto-train collisions despite the presence of automatic warning signals and gates.

Benefits of Freeway

The elimination of this railroad grade crossing, the unsnarling of the cross-traffic situation, the removal of heavy congestion from the town's main street, the resulting improved appearance of the town due to the routing of the freeway having removed portions of the more undesirable buildings, the attendant construction of new businesses along the frontage roads, and the inevitable growth of this community, all due largely to the new highway, add up to sizeable benefits.

A contract was awarded on July 15, 1953, to the Electric and Machinery Service, Inc. of South Gate for installation of lighting facilities and signs. The contract allotment is for $35,300. Work was started under this contract on August 3, 1953, with R. E. DeGroff as resident engineer.

While there is little out of the ordinary in the construction procedure on this project, the site and climatic conditions compel "the bard to twang his lyre in ecstasy." Topping the old Conejo grade westbound, there bursts upon the traveler a panorama of rich, level, cultivated fields and orchards surrounded by the green slopes of the hills. The clear air, free from any trace of fog or smog, brings forth the glories of nature in sharp detail at great distances. And the sweltering heat in other areas passed through by the traveler is quickly forgotten, for seldom does the temperature in the Camarillo Valley rise above 78 degrees.

Distinguished Sidewalk Super

This story of the Camarillo Freeway would not be complete without mention of the distinguished sidewalk superintendent who visits the job frequently. This is none other than Don Adolfo Camarillo. This sprightly gentleman is 89 years young. He makes his business calls in person and actively manages his vast interests. Don Adolfo was born in nearby Ventura. At the age of 17 he became manager of the estates of his father. These comprised vast acreage in the vicinities of Ojai, Ventura and Oxnard.



DON ADOLFO CAMARILLO

Adolfo Camarillo will always be remembered by the State Division of Highways for his generous donations of land for badly needed highway improvements and particularly for the time he played host to some 500 people attending the ribbon-cutting ceremonies on May 1, 1937, of completed state highway construction on the Conejo grade, a short distance southeasterly of the town of Camarillo. Don Adolfo arranged for a barbecue in a setting that was typical of the hospitality in early Spanish days of California, with Spanish musicians and dancers in costume. This universally loved pioner of Ventura County acted as Grand Marshal leading an imposing calvacade of riders mounted on Arabian white horses. Brown-robed Franciscan friars followed, with prospectors, trappers, oxen, Mexican correta, covered wagons, pony express riders, stagecoaches, buckboards, surreys and automobiles ranging from the earliest models to the then modern 1937 car of streamlined elegance.

Don Adolfo and his brother Juan in 1914 built the large, beautiful church in Camarillo as a family chapel. On his brother's death in 1936 he deeded the church to the local Catholic diocese. Adolfo Camarillo has on many occasions proved himself a broad-minded, public-spirited and generous citizen. One can feel honored to say to him, "Su seguro servidor, que beso su mano."

In Memoriam

CHARLES T. HARBEY

Funeral services were conducted for Charles Thornton Harbey, retired maintenance superintendent, on September 10, 1953, at Forest Lawn in Glendale at the Little Church of the Flowers. Mr. Harbey died September 6th while on a visit in San Diego. His home was at 915 Newton Street, San Fernando, where he lived for many years while State Highway Maintenance Superintendent for the northerly portion of Los Angeles County, including the Ridge Route. He will be remembered by many motorists and the trucking industry for his devotion to duty and long hours spent keeping the Ridge Route open to traffic during heavy storms.

Mr. Harbey was born June 1, 1889, in Kingston, New Mexico, and at an early age moved to Texas. He first went to work for the California State Division of Highways as a maintenance foreman on June 19, 1924. On January 1, 1933, he was promoted to maintenance superintendent, which position he held until his retirement on July 1, 1953.

He is survived by his wife, Myrtle A. Harbey; his brother, George Harbey, who is employed by the State Division of Highways in the Fresno district; two sisters, Mrs. Rose Jones and Mrs. Maude McLindon, and a granddaughter, Patricia Price.

Mr. Harbey was a member of San Fernando Lodge 343, F. & A. M., Royal and Select Masters, San Fernando Valley Council No. 40, and Royal Arch Masons, Chapter 136.

Progress

Next to Last Section of Hollywood Freeway Is Opened to Traffic

By C. J. WOODBRIDGE, Resident Engineer

On August 17, 1953, the next to the last link for a direct high speed route from Los Angeles Civic Center to the San Fernando Valley was completed and opened to traffic. This section of the Hollywood Freeway extends from Cahuenga Boulevard to Gower Street, a distance of 0.6 mile. It includes a network of five bridges, six ramps and several retaining walls. Three additional bridges, Cahuenga Boulevard Undercrossing, Holly Drive Undercrossing and Gower Street Undercrossing, were built previously under separate contracts. One of the most striking features is a "three-level" separation at Franklin Circle.

A welcome change in the area is the wide, new, six-lane Franklin Avenue open cut roadway, on easy grades, as compared with the old two-lane roadway over the hill on very steep grades. The freeway itself is elevated and affords a striking view, especially at night, of Hollywood and the City of Los Angeles, from the beaches to Civic Center.

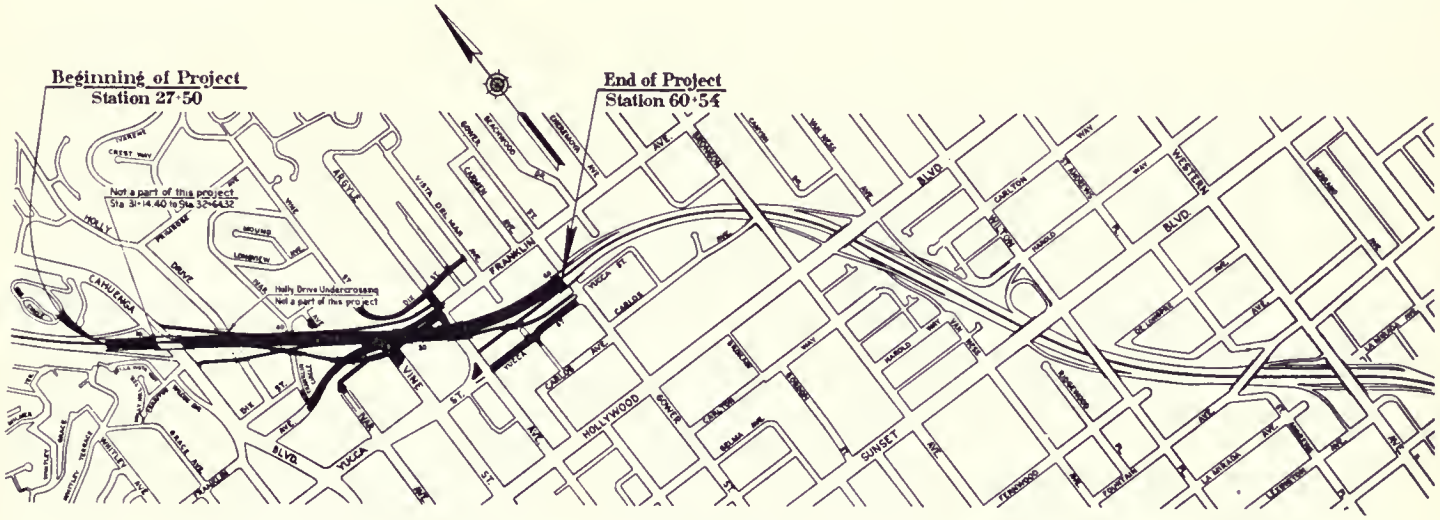
The largest and most involved structure is the Argyle Avenue-Franklin Avenue Undercrossing. This structure is a reinforced concrete, box girder type bridge over 600 feet in length. More than 8,400 cubic yards of concrete were used in the structure, and one pour of 765 cubic yards for the bottom slab and girder stems is believed to be the largest single continuous pour ever made of this type.

The importance of this section of the freeway is well understood by the general public. During the morning and evening rush hours the local area of Hollywood has been a congested "bottleneck" for traffic.

About April of next year it is expected that the one remaining contract on the Hollywood Freeway at Highland Avenue will be completed and then well in excess of 100,000 cars per day will move between the Civic Center of Los Angeles and San Fernando Valley without interruption by construction work. At the present time an estimated 25,000 cars per day are using this newly completed section.

The contract work for construction on this 0.6 mile of freeway amounted to $1,674,000. The cost

In the City of Los Angeles, Hollywood Freeway between Cahuenga Blvd. and Gower St.



Net Length of Project 3304 feet · 0.63 mile



LEFT—Looking east on completed section of Hollywood Freeway. It is estimated that this section will carry well in excess of 100,000 cars per day. Bridge in foreground is Cahuenga Boulevard Undercrossing. Bridge at right center is one of two bridges of the Vine Street off-ramp. RIGHT—Looking west on remaining section of Hollywood Freeway to be completed. This section should be completed about next April.

of the bridges and retaining walls amounted to 70 percent of the entire project, the remaining 30 percent being roadwork.

Winston Bros. Company was the contractor for the project, with Jack Yount, R. K. Harris, and Hugh Thompson as successive project managers, and Jim Redpath as structure superintendent.

The State was represented by the writer as Resident Engineer, with C. C. French and B. A. Gentry as successive District VII representatives in charge of road work.

Looking southeast at Argyle Avenue—Franklin Avenue Undercrossing. Bridge is over 600 feet in length.



Roadside Planting

This Phase of Highway Construction Is for Safety

THE PLANTING of shrubs, trees and ground cover along California highways is primarily a matter of safety and economy. The often-used term "landscaping" is in most cases a misnomer.

Actual landscaping, in the sense of roadside planting for improved community appearance, is rare. It represents only a minute portion of state highway construction costs. In view of California's vast highway needs, funds for landscaping are rigidly restricted as a matter of policy.

Criticism of the Division of Highways for expenditures on so-called landscaping, has overlooked the fact that most of the roadside planting is an essential element of practical highway design, necessary to protect the public's investment in safety and ease of travel. A more truly descriptive term for this necessary function is "roadside development."

Essential Requirements

Expenditures for roadside development on state highways are approved only if they will do one or more of the following:

1. Improve traffic safety.
2. Control weeds and reduce fire hazards.
3. Prevent erosion, thus keeping down future costs of upkeep and repair.

In the past two years, the total cost of construction on state highways has totaled some $183,000,000. The outlay for roadside development was about $1,176,000, or about 64 cents out of every hundred dollars of construction. For landscaping, included in the total for roadside development, the amount expended was only $86,-441.

Even some of the projects included under the heading of landscaping, serve practical as well as aesthetic purposes. For example, one "landscaping" item in recent years is the shrubbery along the Eastshore Freeway which masks the busy waterfront industrial area of Oakland. Others are the sections of lawn along the Hollywood and Santa Ana Freeways which have proved easier and cheaper to keep clear of wind-blown papers and trash than other types of planting. Another is the high thick screen of Japanese privet which absorbs traffic sounds along portions of the freeways in the Los Angeles area.



Trees and shrubs on a straight and level section of U. S. 40 (between Davis and Dixon) call the attention of motorists to the fact that they are approaching a bridge

Headlight Screening

An example of roadside development to augment traffic safety on multi-lane divided highways is the planting of high-growing shrubs in the median or dividing strip. The foliage reduces the tiring impact of oncoming headlights. At the same time it provides a barrier against illegal and dangerous random crossings of the dividing strip.

Some of the level stretches of the U. S. 99 expressway through the San Joaquin Valley lend themselves readily to this type of natural safety treatment. Careful selection of plants which flourish in the particular region, such as oleanders, helps hold down maintenance and replacement costs.

Another type of planting for the purpose of headlight screening consists of vines planted along fences between the roadways. Portions of the Arroyo Seco Freeway between Los Angeles and Pasadena and of the North Sacramento Freeway offer examples of this type of screening.

Less apparent to the motorist, but likewise important to his safety, is the use of planting for what highway engineers call "traffic delineation."

Danger Signals

Groups of trees or shrubs, strategically placed and visible for long distances, are being used to alert drivers to the imminence of some change in the driving conditions ahead, such as a bridge, an off-ramp, or a curve. Tall-growing and disease resistant varieties of palm and eucalyptus trees are often used for this purpose.

Off-ramps on the Hollywood Freeway are marked by distinctive plantings. On U. S. 40, between Davis and Dixon, several bridges on a long straight stretch of highway are heralded thousands of feet ahead by the presence of a carefully-placed clump of trees and bushes. In urban areas, where city streets dead-end abruptly at freeways, a row of trees straight ahead in his path tends to make the motorist ease up on the throttle long



On this new section of freeway the soil will be kept in place by means of ice plant and natural grasses on the adjoining hillsides and the sloping shallow ditch which separates the northbound and southbound roadways. This is an example of planting which the Division of Highways has found necessary in enhancing traffic safety and keeping down future maintenance costs. The freeway shown here is U. S. 101 in Oceanside.

before he can read the "Not a Through Street" sign.

The most widespread use of planting is to keep the roadside soil in place wherever it slopes up or down from the highway. It is much safer and cheaper to plant a little vegetation than to keep scraping off the roadway the dirt washed down from a cut slope or to keep shoring up an embankment undermined by gullies.

Maintenance Costs Reduced

The Arroyo Seco Parkway is one of the best examples of multiple-purpose planting. The thick green English ivy which covers the cut slopes along this famous freeway, while appreciated for its ornamental value, was actually planted for erosion, weed and fire control.

Similarly, the colorful ice plant on the slopes of the Atlantic Boulevard interchange on the Santa Ana Freeway is there because it will save thousands of dollars in maintenance costs. The "landscaping" effect, is purely a by-product. This is also true of the startling springtime beauty of the ice plant bordering U. S. 101 in Solomon Canyon, south of Santa Maria.

Where true landscaping is undertaken for the sake of attractiveness, it is a matter of preserving and enhancing the appearance of the community rather than of the highway. It is done only where there is general agreement as to the desirability and necessity of the work. Also, in accordance with California Highway Commission policy, no landscaping along state highways is authorized unless proper local ordinances are in effect to protect the investment against detractive sign installations.

All highway expenditures, including those for roadside development along state highways, are rigidly scrutinized.

No such expenditures are recommended to the Highway Commission unless it is certain that they will more than pay their way in terms of greater traffic safety, control of weeds and fire hazards, and keeping down the costs of highway maintenance.

Traffic Studies

Need for Network of Freeways in Los Angeles Area Clearly Evident

By C. G. BEER, Assistant District Traffic Engineer

CONTINUOUS traffic studies of the Hollywood Freeway as its construction has progressed show the wisdom of the local planning agencies in anticipating a complete network of freeways to adequately serve the tremendous desire for motor vehicle travel in the Los Angeles metropolitan area. This gigantic transportation facility from Vineland Avenue in the San Fernando Valley to the Los Angeles Civic Center is already carrying its full designed capacity volume of traffic and the final link will not be open to traffic until next spring.

Operating Characteristics

Operation of the Hollywood Freeway is emphasizing the importance of certain factors in planning and design which were previously noted on the Arroyo Seco Freeway and on similar roads in other parts of the State. Chief among these factors is the great increase in space required to safely handle weaving movements and speed transitions. If the freeway is to serve the purpose for which it is being constructed, the average operating speed will be almost double that of the conventional city arterial. The transition from the high speed of the freeway to the lower speed of the arterials must be made safely at each connection. This can be done by proper design of the on and off ramps, and interchange lanes.

Design of such transitions must provide for the individual 55 m.p.h. freeway traveler during hours of low traffic volume as well as the great volumes of 35 m.p.h. travelers when the freeway carries its full capacity in the peak hours. The accompanying charts and tables indicate traffic volumes encountered on the Hollywood Freeway and its connecting ramps.

125,000 Vehicles Per Day

In *Figure 1* (*See pages 32-35*) is shown the history of traffic counts made on the Hollywood Freeway since its first opening on December 27, 1950. In addition to all inlet and outlet ramps, the traffic volumes at four representative locations on the freeway itself are shown for each stage of development. These points are at the Vermont Avenue Overcrossing, the Rosemont Avenue Overcrossing, the Beaudry Avenue Overcrossing, and the Grand Avenue Overcrossing. It can be seen that the 24-hour weekday volume passing under the Rosemont Avenue structure had reached approximately 125,000 by May 1953.

The annual statewide count of July 12-13, 1953, verified the volume of 121,000 shown in *Figure 1* at the Beaudry Avenue structure.

TABLE 1. TRAFFIC COUNT ON HOLLYWOOD FREEWAY

500 Ft. E. of Glendale Blvd. Off-ramp. Friday, July 24, 1953. Westbound (outbound) only.

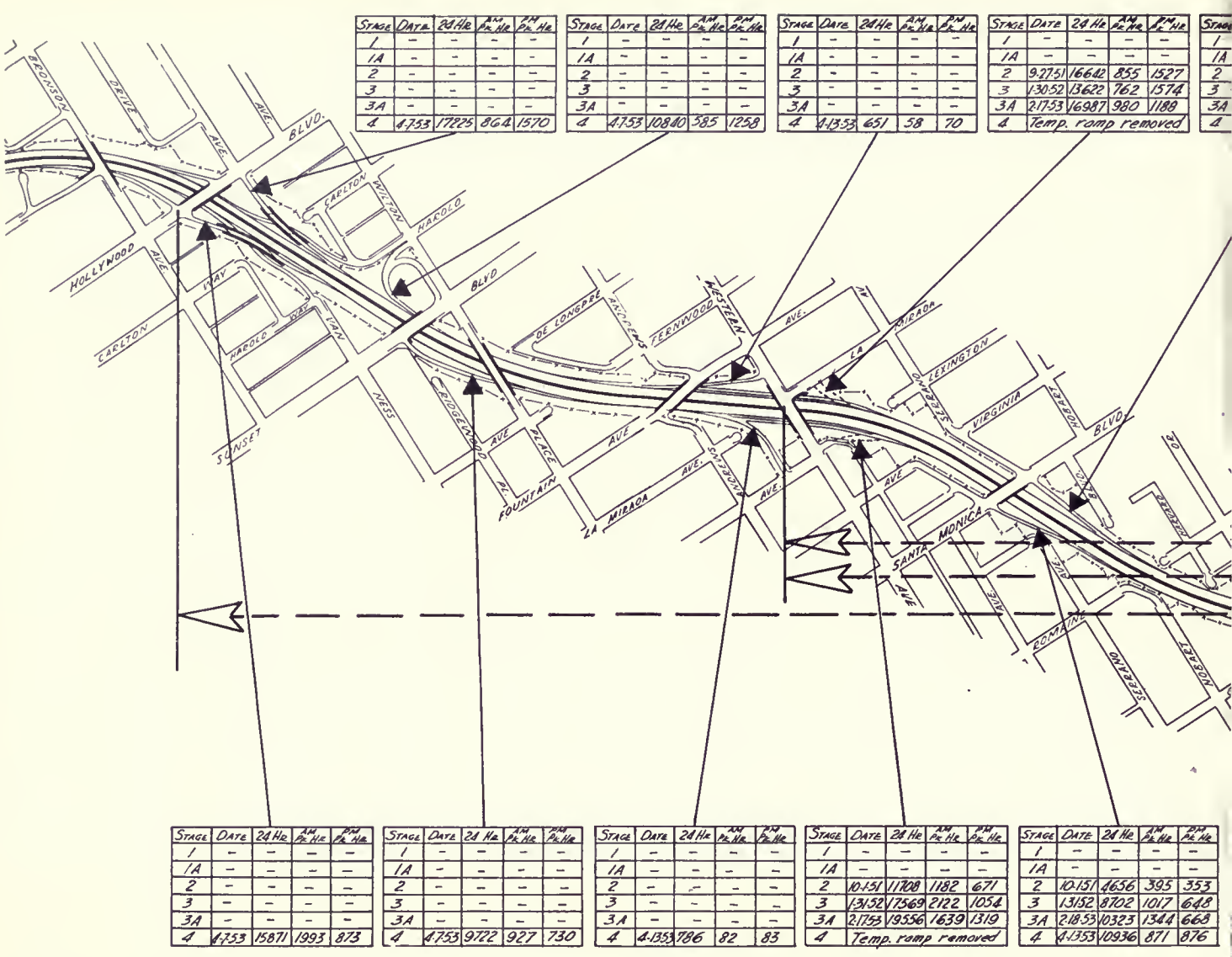
	LANE	Inside (left)	Inside (middle)	Outside (middle)	Outside (right)	Total 4 lanes
A.M.	12- 1	219	660	311	203	1,393
	1- 2	82	354	144	86	666
	2- 3	52	194	158	66	470
	3- 4	26	122	82	35	265
	4- 5	35	106	100	48	289
	5- 6	51	180	141	115	487
	6- 7	437	254	544	442	1,677
	7- 8	967	757	857	744	3,325
	8- 9	867	1,049	790	680	3,386
	9-10	587	937	704	551	2,779
	10-11	559	891	723	570	2,743
	11-12	652	827 †	750	622	2,851
P.M.	12- 1	677	786 †	825	611	2,899
	1- 2	593	933	746	527	2,799
	2- 3	880	666	898	683	3,127
	3- 4	1,087	651	961	815	3,514
	4- 5	1,620	1,052	1,294	1,272	5,238
	5- 6	1,844	1,384	1,357	1,297	5,882
	6- 7	1,233	1,185	967	881	4,266
	7- 8	819	951	804 †	674	3,248
	8- 9	718	931	504 †	560	2,713
	9-10	567	767	475 †	515	2,324
	10-11	428	681	553 †	375	2,037
	11-12	432	618	446 †	380	1,876
	Total	15,432	16,936	15,134	12,752	60,254

† Counter trouble. Used counts of Thursday, July 23d.

Temporary "End Freeway"

One item of interest in *Figure 1* is the peak hour volume carried by the terminal ramp connection in each stage of operation. It can be seen that the westbound off-ramp at Silver Lake Boulevard reached an evening peak hour volume of 1,862 at the time it was the terminal ramp (Stage 1A). After opening to Western Avenue, the Silver Lake ramp dropped to 659 and has since stabilized at about 900.

On opening to Western Avenue (Stage 2), the temporary westbound off-ramp there immediately carried an evening peak of 1,527. This later rose slightly, coupled with a very great rise in the adjacent off-ramp at Santa Monica Boulevard. Prior to



Stage	Date	24 Hr	A.M. Pk. Hr.	P.M. Pk. Hr.
1	–	–	–	–
1A	–	–	–	–
2	–	–	–	–
3	–	–	–	–
3A	–	–	–	–
4	4-7-53	17225	864	1570

Stage	Date	24 Hr	A.M. Pk. Hr.	P.M. Pk. Hr.
1	–	–	–	–
1A	–	–	–	–
2	–	–	–	–
3	–	–	–	–
3A	–	–	–	–
4	4-7-53	10840	585	1258

Stage	Date	24 Hr	A.M. Pk. Hr.	P.M. Pk. Hr.
1	–	–	–	–
1A	–	–	–	–
2	–	–	–	–
3	–	–	–	–
3A	–	–	–	–
4	4-13-53	651	58	70

Stage	Date	24 Hr	A.M. Pk. Hr.	P.M. Pk. Hr.
1	–	–	–	–
1A	–	–	–	–
2	9-27-51	16642	855	1527
3	1-30-52	13622	762	1574
3A	2-17-53	16987	980	1188
4	Temp. ramp removed			

Stage	Date	24 Hr	A.M. Pk. Hr.	P.M. Pk. Hr.
1	–	–	–	–
1A	–	–	–	–
2	9-27-51	16642	855	1527
3	1-30-52	13622	762	1574
3A	2-17-53	16987	980	1188
4	Temp. ramp removed			

Stage	Date	24 Hr	A.M. Pk. Hr.	P.M. Pk. Hr.
1	–	–	–	–
1A	–	–	–	–
2	–	–	–	–
3	–	–	–	–
3A	–	–	–	–
4	4-7-53	15871	1993	873

Stage	Date	24 Hr	A.M. Pk. Hr.	P.M. Pk. Hr.
1	–	–	–	–
1A	–	–	–	–
2	–	–	–	–
3	–	–	–	–
3A	–	–	–	–
4	4-7-53	9722	927	730

Stage	Date	24 Hr	A.M. Pk. Hr.	P.M. Pk. Hr.
1	–	–	–	–
1A	–	–	–	–
2	–	–	–	–
3	–	–	–	–
3A	–	–	–	–
4	4-13-53	786	82	83

Stage	Date	24 Hr	A.M. Pk. Hr.	P.M. Pk. Hr.
1	–	–	–	–
1A	–	–	–	–
2	10-1-51	11708	1182	671
3	1-31-52	17569	2122	1054
3A	2-17-53	19556	1639	1319
4	Temp. ramp removed			

Stage	Date	24 Hr	A.M. Pk. Hr.	P.M. Pk. Hr.
1	–	–	–	–
1A	–	–	–	–
2	10-1-51	14656	395	353
3	1-31-52	18702	1017	648
3A	2-18-53	10323	1344	668
4	4-13-53	10936	871	876

Stage 3A, the Western Avenue ramp was narrowed to one lane and the Santa Monica Boulevard ramp was widened to two lanes. This was immediately reflected in a drop to 1,188 at Western Avenue and a rise to 1,703 at Santa Monica. It is commonly observed that the two ramps at the temporary end of a freeway facility act in combination in handling peak hour loads, and in this case the ramp next to the terminal ramp was made to take the greater volume.

With opening to Hollywood Boulevard in Stage 4, a terminal peak hour of 1,570 was observed at the Hollywood Boulevard ramp, while Santa Monica Boulevard dropped to 1,030. At this time the temporary ramp at Western Avenue had been removed entirely.

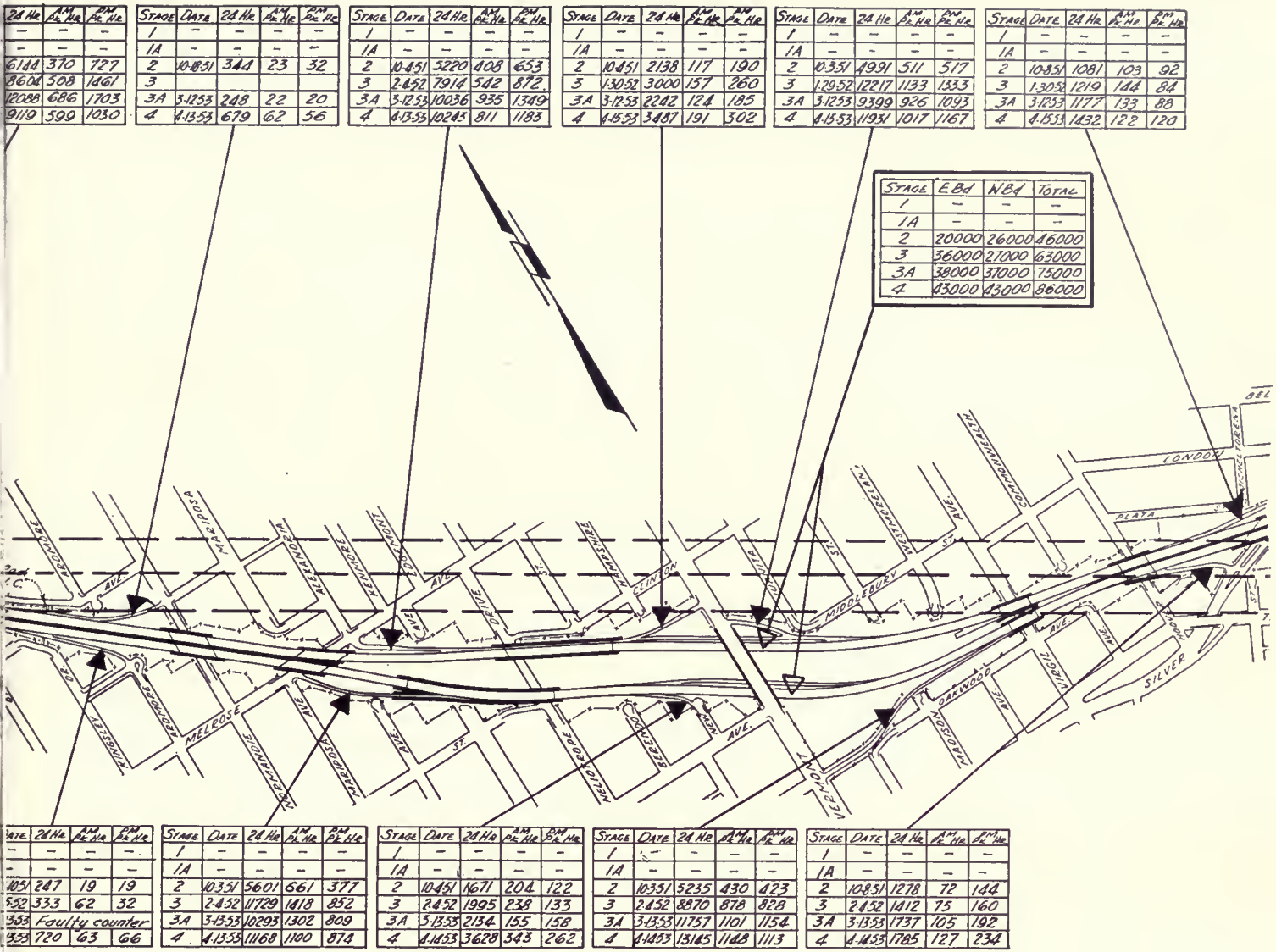
Lane Volumes

Table 1 shows the hourly westbound traffic volume in each lane of the freeway at a point about one-quarter mile west of the Beaudry Avenue Overcrossing, as recorded on Friday, July 24, 1953.

The peak hours were somewhat lower than usual on this day, possibly because intensive police patrol of the freeway had been initiated a few days before. Also, the automatic counters may have counted about 5 percent low on each of the two middle lanes due to simultaneous crossing of two vehicles over the counter hose. It will be noted that the left lane carried more volume than any other lane each hour from 3 p.m. to 7 p.m. The design capacity of 1,500 per lane was exceeded for two hours in this lane, and the peak hour total for four lanes is close to the design capacity of 6,000.

A total westbound volume of 6,274 was counted manually between 5 and 6 p.m. in the annual count of Monday, July 13, 1953, and 6,666 in the same count in 1952. Each of these counts shows a flow averaging well over 1,500 per lane.

Supplemental traffic counts made at the time of the annual July census indicate that most of the metropolitan freeways carry their maximum daily volumes on weekdays, with less on Saturdays, and still less on Sundays (*see Table 3*).



Stage	EBd	NBd	Total
1	–	–	–
1A	–	–	–
2	20000	26000	46000
3	36000	27000	63000
3A	38000	37000	75000
4	43000	43000	86000

TABLE 2. DISTANT ROUTES SHOWING EFFECT OF HOLLYWOOD FREEWAY

(16-hour July Monday Counts)

Distance from freeway, miles	On Santa Manica Blvd. W. of Sunset 1.1	On Sunset Blvd. (Rt. 2) W. of Sta. Mon. 1.1	On Sunset Blvd. (Rt. 2) E. of Sta. Mon. 1.1	On Olympic (Rt. 173) W. of Figueroa 1.5	On San Fernanda (Rt. 4) N.W. of Ave. 26 2.1	On Slausan Ave. W. of Figueroa 6.1	On Slausan Ave. E. of Figueroa 6.1	On Manchester Ave. (Rt. 174) W. of Figueroa 8.1	On Manchester Ave. (Rt. 174) E. of Figueroa 8.1
1947	9,204	22,086	30,555	No count	No count	No count	No count	30,859	30,044
1948	9,414	21,464	31,155	33,025	No count	25,807	25,471	31,675	31,727
1949	9,263	21,768	30,314	34,163	29,677	26,728	27,481	29,196	30,846
1950	9,662	21,877	31,515	37,265	32,077	29,085	29,790	30,220	32,786
Hollywood Freeway opened								Stage 1	
1951	7,563	19,973	27,579	36,742	32,409	26,533	28,015	28,349	29,483
								Stages 2 and 3	
1952	5,634	12,119	16,661	34,087	31,902	27,552	27,807	28,636	29,506
1953	5,690	10,316	15,299	31,713	32,463	27,779	27,683	28,489	30,052

Stage	Date	24 Hr.	A.M. Pc. Hr.	P.M. Pc. Hr.
1	10-15-51	13612	918	1621
1A	3-27-51	16453	1142	1862
2	9-28-51	3827	529	659
3	1-29-52	6737	561	1019
3A	3-4-53	7225	578	957
4	4-6-51	7133	553	885

Stage	Date	24 Hr.	A.M. Pc. Hr.	P.M. Pc. Hr.
1				
1A				
2	10-16-51	Faulty counter		
3				
3A		872	72	91
4		1438	101	117

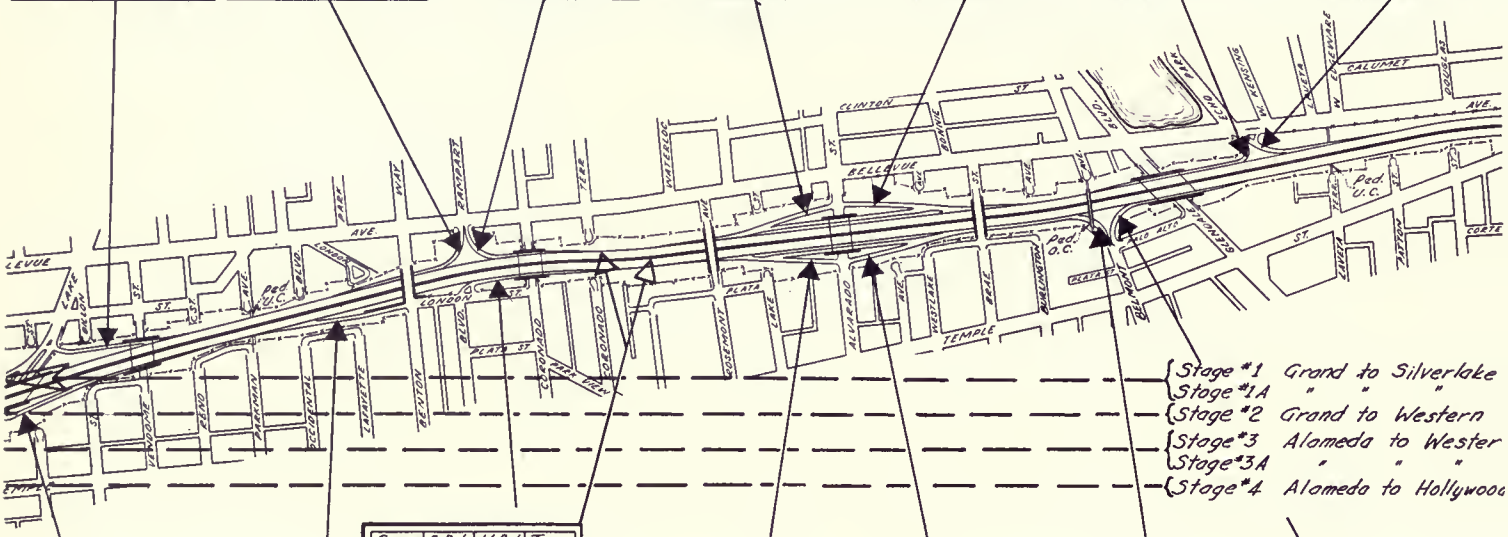
Stage	Date	24 Hr.	A.M. Pc. Hr.	P.M. Pc. Hr.
1	10-15-51	1631	107	374
1A	3-26-51	2233	133	641
2	10-15-51	1663	124	277
3				
3A	3-11-53	2743	182	526
4	5-4-54	2781	162	531

Stage	Date	24 Hr.	A.M. Pc. Hr.	P.M. Pc. Hr.
1				
1A				
2	10-15-51	3132	165	395
3	1-31-52	4750	250	510
3A	3-11-53	5038	254	475
4	4-29-53	5246		

Stage	Date	24 Hr.	A.M. Pc. Hr.	P.M. Pc. Hr.
1				
1A				
2	10-16-51	395	29	36
3	1-25-52	3402	248	314
3A	3-11-53	3898	304	370
4	5-4-53	3942	290	328

Stage	Date	24 Hr.	A.M. Pc. Hr.	P.M. Pc. Hr.
1				
1A				
2	10-15-51	2702	254	419
3	1-29-52	2900		
3A	3-10-53	2643	340	224
4	4-29-53	2823		

Stage	Date	24 Hr.	A.M. Pc. Hr.	P.M. Pc. Hr.
1				
1A				
2	10-15-51	1741	89	266
3	1-29-52	3803	191	560
3A	3-10-53	5057	224	736
4	4-29-53	5088		



Stage	E. Bd.	W. Bd.	Total
1	14000	15000	29000
1A	19000	19000	38000
2	34000	36000	70000
3	53000	46000	99000
3A	58000	54000	112000
4	64000	61000	125000

Stage	Date	24 Hr.	A.M. Pc. Hr.	P.M. Pc. Hr.
1	1-11-51	12548	1186	775
1A	3-29-51	16800	1869	1125
2	9-27-51	8924	690	868
3	2-4-52	8814	1022	723
3A	3-13-53	8500	992	704
4	4-14-53	8580	903	696

Stage	Date	24 Hr.	A.M. Pc. Hr.	P.M. Pc. Hr.
1				
1A				
2	10-16-51	1125	118	96
3	2-5-52	1542	136	140
3A	3-13-53	1382	135	108
4	4-29-53	1839		

Stage	Date	24 Hr.	A.M. Pc. Hr.	P.M. Pc. Hr.
1	1-10-51	1805	358	128
1A	4-4-51	1972	392	130
2	10-8-51	2079	381	147
3	1-25-52	2400		
3A	3-16-53	2797	415	237
4	4-28-53	2849		

Stage	Date	24 Hr.	A.M. Pc. Hr.	P.M. Pc. Hr.
1				
1A				
2	10-14-51	3086	304	240
3	2-5-52	4216	370	320
3A	3-16-53	4480	416	323
4	4-28-53	4712		

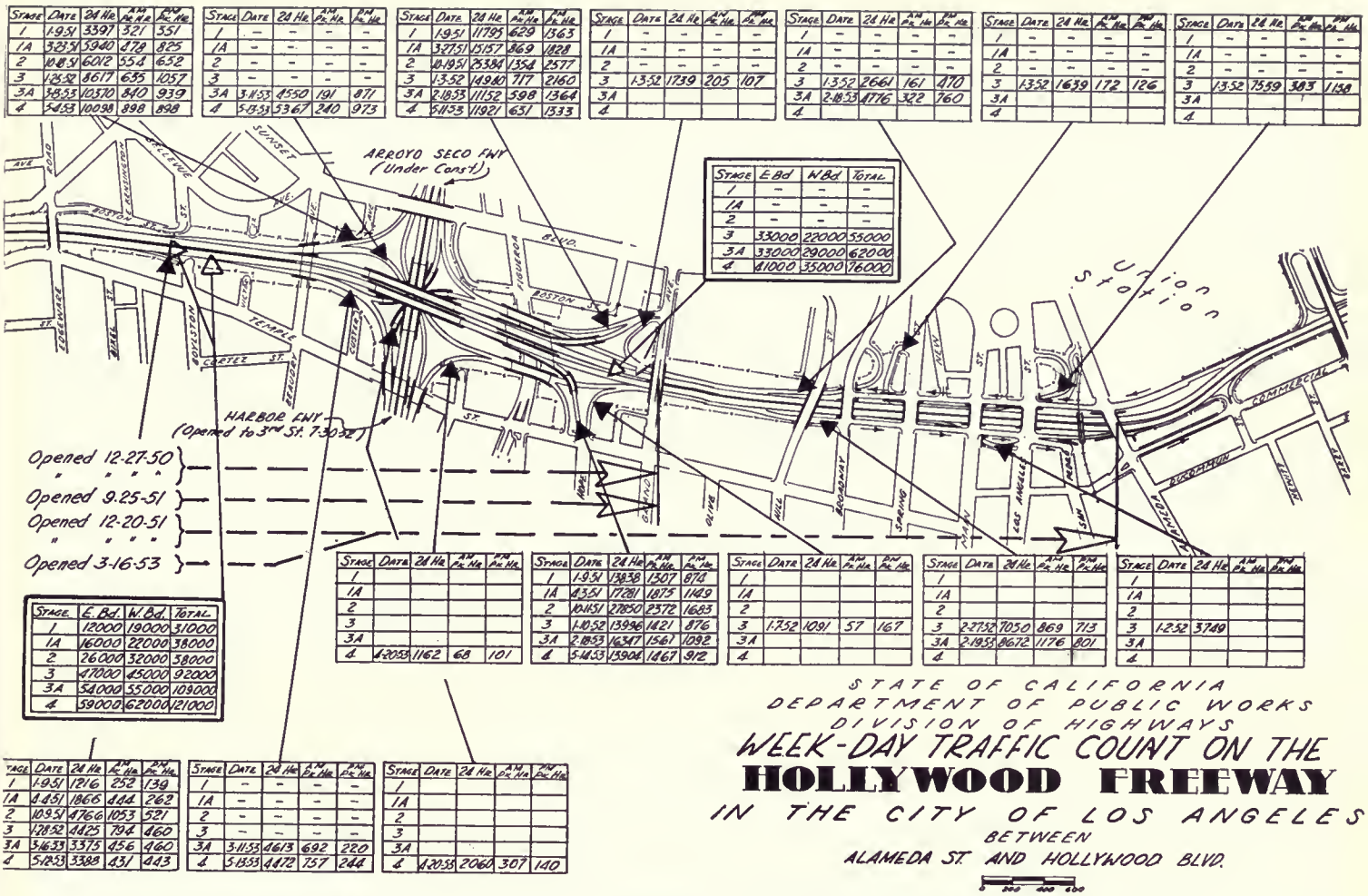
Stage	Date	24 Hr.	A.M. Pc. Hr.	P.M. Pc. Hr.
1				
1A				
2	10-16-51	1528	112	115
3	1-28-52	4143	337	407
3A	3-16-53	3671	304	356
4	4-28-53	3727		

Stage	Date	24 Hr.	A.M. Pc. Hr.	P.M. Pc. Hr.
1				
1A				
2	10-16-51	2488	418	235
3	2-6-52	3164	852	244
3A	3-16-53	2833	375	302
4	4-29-53	2842		

Stage	Date	24 Hr.	A.M. Pc. Hr.	P.M. Pc. Hr.
1				
1A				
2	10-17-51	524	38	49
3	2-6-52	1752	214	183
3A	3-16-53	2978	335	236
4	4-28-53	2866		

Looking easterly along Hollywood Freeway, showing traffic over the four-level grade separation structure, with Los Angeles civic center buildings in background





Diversion From Distant Streets

Coupled with the growing traffic on the Hollywood Freeway, there has been a reduction of volumes on many of the parallel city streets. Some of this diversion was shown in the article by Mr. Harding in the March-April, 1953, issue of the magazine. The paralleling arterials then become more attractive for local traffic desiring to do business in the area.

As additional evidence of the wide zone of influence of the freeway, a clearly defined break in the general rising trend of traffic volumes on important parallel streets at a considerable distance from the freeway is shown in *Table 2*. In looking at these figures it should be remembered that there is a strong general upward trend in the counts for the metropolitan area. Even a slight drop in the count from one year to the next means that the general trend has been offset. Only strong influences such as reach-

TABLE 3. 24-HOUR FREEWAY TRAFFIC COUNTS ON VARIOUS DAYS OF WEEK

Hollywood Freeway, at Beaudry Avenue Bridge

		Eastbound (4 lanes)	Westbound (4 lanes)
Saturday	(7-11-53)	51,900	------
Sunday	(7-12-53)	39,900 *	46,345 *
Monday	(7-13-53)	55,400 *	61,705 *
*	*	* * * * *	*
Friday	(7-24-53)	------	60,254

Santa Ana Freeway, at Indiana Street Bridge

		Eastbound only (3 lanes)	
Sunday	(7-12-53)	24,022	------
Monday	(7-13-53)	32,069	------
*	*	* * * * *	*
Friday	(7-17-53)	33,952	------
Saturday	(7-18-53)	28,685	------
Sunday	(7-19-53)	27,193	------

Arroyo Seco Freeway, at Cypress Avenue Pedestrian Bridge

		Eastbound only (3 lanes)		
Friday	(7-10-53)	31,414	(7-17-53)	31,977
Saturday	(7-11-53)	25,129	(7-18-53)	25,402
Sunday	(7-12-53)	22,642	(7-19-53)	22,280

* Unbalance in two directions due to effect of Boylston Street and Custer Avenue Ramps.



UPPER—Looking easterly along Hollywood Freeway from Rosemand Bridge toward Alvarado Street grade separation, with Bonnie Brae Avenue overcrossing in background. This view shows a typical condition of dense traffic in both directions on this freeway. LOWER—Looking westerly along Hollywood Freeway from Belmont Avenue pedestrian bridge, showing dense traffic.



ing capacity of the street or opening a new parallel street will cause such a break in the general trend.

New Concept

Table 2 and similar studies on freeways in other parts of the United States suggest a new concept of the extent of influence of such a highway on other arteries in a metropolitan street network. In capacity to move large traffic volumes and in the speed with which persons and goods can be transported (and most definitely in the safety of this transport), the freeway is in a class far above conventional arterial streets. A freeway, with its ramp connections, affects the traffic flow pattern and serves the needs of users in a very wide band along its route.

Grand National

New Freeways and Improved Highways Benefit Cow Palace

NEW FREEWAYS and other improved highway conditions will make travel to this year's Grand National Livestock Exposition, Horse Show and Rodeo safer and more pleasant than ever before for the scores of thousands of motorists who annually attend this mighty combination animal show.

This was disclosed by Nye Wilson, Secretary-Manager of the Cow Palace, on the basis of a report from R. P. Duffy, Assistant District Engineer, District IV, Division of Highways, comprising the nine bay counties.

The Grand National, mighty combination of national livestock exposition, full division national horse show, world's championship rodeo finals, national Cutting Horse Association championship finals and spectacular arena acts, will be held Oct. 30 to Nov. 8.

By that time, Duffy's report indicated, it is virtually certain that the new section of freeway in the vicinity of Third Street in San Mateo, including the new approach to the San Mateo Bridge, will be in traffic service eliminating all surface turns.

Better Highway Facilities

Also scheduled to be completed by that time is the new section of four-lane divided freeway from a mile and a half west of Dublin easterly to Camp Parks speeding up travel from the rich agricultural areas of the San Joaquin Valley.

Exhibitors and visitors from the Redwood Empire will find the freeway construction on Highway 101 from the Forbes Overhead north of San Rafael to Ignacio completed since last year and much progress made on the section through San Rafael.

While work will be in progress on the Waldo grade, on the Altamont Pass into Hayward and on the Bayshore Highway between San Mateo and Redwood City adjacent to the existing roadway there will be little impediment to the free flow of traffic, Duffy's report said.



Coraleen Jurian, a former queen of the Grand National Livestock Exposition, Horse Show and Rodeo, points with pride to the huge "Cow Palace" lettering which is part of the remodeling.

Cow Palace Improved

Meanwhile considerable construction work has been completed at the Cow Palace which is now ready to take its place as one of the world's finest arenas. A new floor of 10-inch concrete has been laid in the arena over a network of conduits and cables for telephone lines, telegraph circuits and power mains, and special setups to handle any type of show.

In addition the main arena building and the adjacent horse barns have been painted on the outside for the first time and a new roof has been installed.

The spectacular arena performances this year will be headed by the Wild Stallion Stampede, most exciting and dangerous of all buckaroo events.

New attractions this year will include the Western Trail Riders, a nationally famous group of mounted square dancers from Denver, Colorado, performing in colorful costume under "black lights," and Arthur Allen's Border Collies in a brand new act working with Golden Geese.



Rehearsing for their first appearance at the Grand National Livestock Exposition, Horse Show and Rodeo are these members of the Western Trail Riders, nationally known group of mounted square dancers who perform in colorful costume under "black lights."

Jamboree

Governmental Agencies Cooperate To Make Boy Scout Event a Success

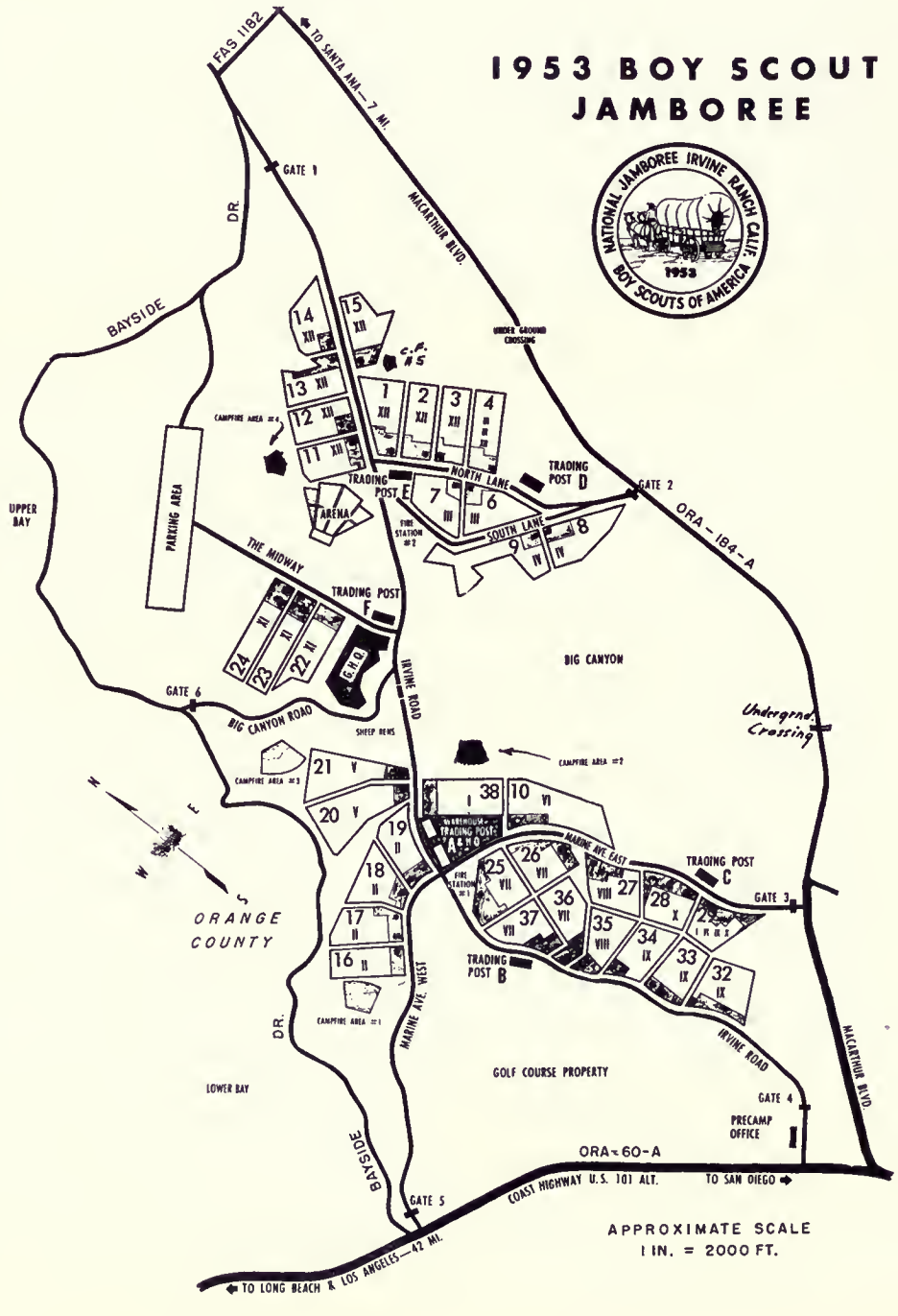
By ROBERT W. ANDERSON, Associate Highway Engineer

(Editor's Note: California was host this summer to the third National Boy Scout Jamboree on the Irvine Ranch in Orange County at a location bounded by three major state highways. Cooperation by various governmental agencies including the State Division of Highways contributed in no small measure towards the success of this event. The author, a deputy scout commissioner, was the chief equipment quartermaster of the Boy Scout Jamboree. He took one month's vacation from his regular duties to get his quartermaster department organized for the encampment.)

On May 1, 1952, a conference was held in P. O. Harding's office in Los Angeles with Ray H. Bryan, Director of Physical Arrangements for the 1953 Jamboree, Boy Scouts of America; W. L. Fahey, District Engineer; John B. Davidson, Highway Superintendent for Orange County, and the author present. Mr. Bryan outlined the type of camp and size of the event contemplated for the 1953 Jamboree. He stated that some 22 sites throughout the United States had been considered and the location on the Irvine Ranch seemed to be the most acceptable. The factors considered in locating a site for a jamboree were first, an area large enough for 50,000 men and boys to camp; secondly, proximity to a metropolitan area from which to obtain food; and thirdly, reasonable closeness to rail transportation.

Site Selected

On May 6, 1952, it was decided to hold the 1953 Jamboree on the Irvine Ranch. The site selected was 3,000 acres located northerly from the junction of McArthur Boulevard and the Coast Highway, both state routes, and was bounded on the west by Bayside Drive (Orange County Road) and Palisades Road (FAS 1182). The Irvine Company had made studies for the area south of Big Canyon on which they had designated possible future roads and they now made a layout of roads for the area north of Big Canyon. By using roads designated for future developments as the basic road system for the jamboree camp, it would be possible to utilize the road construction work in future ranch developments. The earth moving, grading, and shaping to construct 8.5 miles of road on the jam-





Boy Scouts assembling for arena show. This view shows some of the boys waiting for the show and marching columns of boys in the background as far as the eye can see all coming to the arena. Photo by George Bergstrom.

boree site were done gratis by the Irvine Company.

As planning progressed, John B. Davidson, the Division of Highways' superintendent in Orange County, was asked for advice as to the type of surfacing and the cost of the construction of the roads on the site. The Scout organization stated that the roads were to have a 100-foot graded roadway with a 24-foot center portion having a surfacing heavy enough to avoid dust or undue roughness under the jamboree traffic. Mr. Davidson's recommendation for the road surfacing was to roadmix about 670 tons of SC-2 road oil at the rate of one gallon a square yard.

Agencies Cooperate

The problems involved in planning a city for 50,000 people, even though only a tent city of two weeks' duration, are of major proportions, therefore at subsequent conferences it was agreed to contact various governmental agencies. The result was that the California Highway Patrol assigned special squads to handle the jamboree traffic on state highways and adjacent county roads and the Orange County sheriff's department handled policing and traffic control on the grounds; the State Division of Forestry furnished men and equipment for two fire stations; the Orange County Road Department applied to the 8.5 miles of roads on the grounds road oil furnished free by various oil companies; the United States Marine Corps installed a single-span Bailey bridge to supplement an existing two-lane county bridge on Bayshore Drive and furnished water buckets and folding cots for the encampment, while the Army loaned to the Boy Scouts automotive equipment of various types and sizes.

The official registration for the jamboree was 45,401 leaders and boys; approximately 7,000 were leaders, or one adult leader for every seven boys. The camp was divided into 35 sections, each consisting of 34 troops. Each troop was composed of three adult leaders and 35 boys. There were also delegations representing 20 foreign countries. The first boys arrived on July 13th and on July 27th the last ones left the site. About 80 percent came by rail, requiring 83 special trains. They were convoyed in busses from the railhead to the jamboree.

Jamboree Self-supporting

This was the Third National Jamboree and was officially in session from July 17 to July 23, 1953. The First National Jamboree had been scheduled for Washington, D. C., in 1935 but just prior to its opening was canceled and was held in Washington in 1937; the Second National Jamboree was held at Valley Forge in 1950, and the fourth will be held in 1957, thus establishing a pattern of a national jamboree every four years.

The National Jamboree is organized as a nonprofit, self-supporting operation of the Boy Scouts of America. Each person attending the jamboree paid a registration fee of $48. This provided over $2,100,000 with which to construct and operate the camp and feed those who attended. The intensive planning, training, and promotional work that is the necessary preliminary to a national jamboree tremendously strengthens the scouting program.

The troops attending the jamboree are made up of men and boys selected from the top people of their organizations. These groups are formed into

. . . Continued on page 53

Floor Wax

Its Importance as Safety Factor in Division of Highways Offices

By NEIL T. AUSTIN, Associate Chemical Testing Engineer

WHAT DOES floor wax have to do with construction and maintenance of state highways?

Nothing directly, but indirectly floor wax is a necessity to the well being, safety and efficiency of most of the 9,600 employees of the Division of Highways. In providing dustless and bright surroundings in the many offices of the division, at headquarters, in the 11 districts, in the laboratories and shops, good floor wax is essential and the department is concerned with securing the best and most satisfactory wax obtainable.

Someday, there may be a low cost flooring material which will require no maintenance other than sweeping. Even then, as long as we have hardwood, linoleum, and asphalt tile floors, there will exist the problem of maintenance. And this problem consists largely of the search for a satisfactory floor wax.

What is a satisfactory floor wax? From the standpoint of the building maintenance man, the hardest, glossiest wax is the best. Such a wax is easiest to keep clean, and has the longest replacement time. It also presents the most satisfactory appearance.

Safety Is Important

Unfortunately, as hardness and gloss are increased, the tendency toward slipperiness is also increased. With this conflict of properties in mind, the designer of a floor wax attempts to strike a balance, so that adequate safety is obtained without too great a sacrifice in protection, appearance and cost of upkeep.

Floor waxes are usually sold in two types, solvent and emulsion. The solvent type, which may be in either paste or liquid form, usually has a petroleum solvent as a vehicle. This type is used for hardwood floors, but is not satisfactory for linoleum or asphalt tile, as the solvent tends to soften the flooring material. In the emulsion type, the wax is emulsified in water to the extent of 12 to 18 percent solids. This type is easy to apply, but is not used on hardwood floors, due to the harmful effect of the water on the wood. This type is commonly used in office buildings, where the flooring materials are predominantly linoleum or asphalt tile.

Waxes Vary Greatly

Floor waxes vary greatly in the degree of hardness and slip resistance. All manufacturers produce a range of products which vary from very hard to very slip resistant. As previously stated, the preferred wax is the hardest possible that will give the required slip resistance. Even office buildings differ in their requirements, depending upon layout and type of personnel. For example, a building made up of small offices, with little travel in the halls, and with predominantly male employees, can use a harder wax than one having large offices, well-traveled halls, and a high percentage of women wearing high heeled shoes.

The base of most high grade floor waxes is Carnauba wax. So far, at least, it has held its place in the industry against the inroads of the synthetic materials, in spite of being a higher priced product.

The term "wax" has lost much of its original significance. Many substances having wax-like properties, such as paraffin, ceresin, etc., are now classified as waxes. The true waxes are esters of high molecular weight monohydric alcohols. They thus differ from the fats which are esters of the trihydric alcohol, glycerol. True waxes are usually of animal or vegetable origin.

Carnauba Wax Hardest

Carnauba wax is the hardest, and most expensive, of the common waxes. It is primarily the ester of myricul alcohol and cerotic acid, but contains both the free alcohol and free acid. The chemical formula of the ester is $C_{25}H_{51}COOC_{31}H_{63}$.

The wax occurs as a secretion on the leaves of the Carnauba palm in Brazil. Although the Carnauba palm grows in other South American countries, and has been introduced in other tropical countries, it is only the Brazilian palm which produces wax. The regularity of the rainy and dry seasons in Brazil is given as the reason. The wax seems to serve the purpose of protection against rotting action during the wet period, and of prevention against excessive evaporation during the following hot, dry season.

It is estimated that there are 50 million Carnauba palms in Brazil, from which are collected an average of 20 leaves per tree. Each leaf supplies about one-sixth ounce of wax. Thus it takes about five trees to produce one pound of wax per year.

Manufacturing Process

The leaves are cut from the trees, dried for three or four days, and beaten to dislodge the wax. The gathered wax is then placed in boiling water, where it melts and rises to the surface. On cooling, it hardens to a cake on the surface, where it is collected and broken into chunks.

Carnauba wax is marketed in nine grades, determined, for the most part, by color. The wax from the older leaves is darkened by time, and also contains more of the palm's own coloring matter. Normally, the grading is accomplished by classifying the leaves according to color at the time of collection. The more common grades are Nos. 1, 2 and 3 Yellow, 2 and 3 North Country, and 3 Chalky. Yellow is considered the refined grade, and North Country the crude, while Chalky is powdered and contains some dirt. Usually No. 3 North Country is used in the manufacture of floor wax, as the wax is automatically refined in processing.

The Ingredients

The Carnauba Wax is combined with resins and emulsifying agents in order to prepare a stable emulsion in water. Sometimes resins are used to produce the nonslip characteristics, but more commonly a suspension of colloidal silica is incorporated in the batch for this purpose. This has the effect of producing a rough texture on the surface without softening the coating as is the case with resins.

A typical wax formulation would be:

Carnauba wax	30% min.
Colloidal silica	30% min.
Resins and emulsifying agents	Remainder

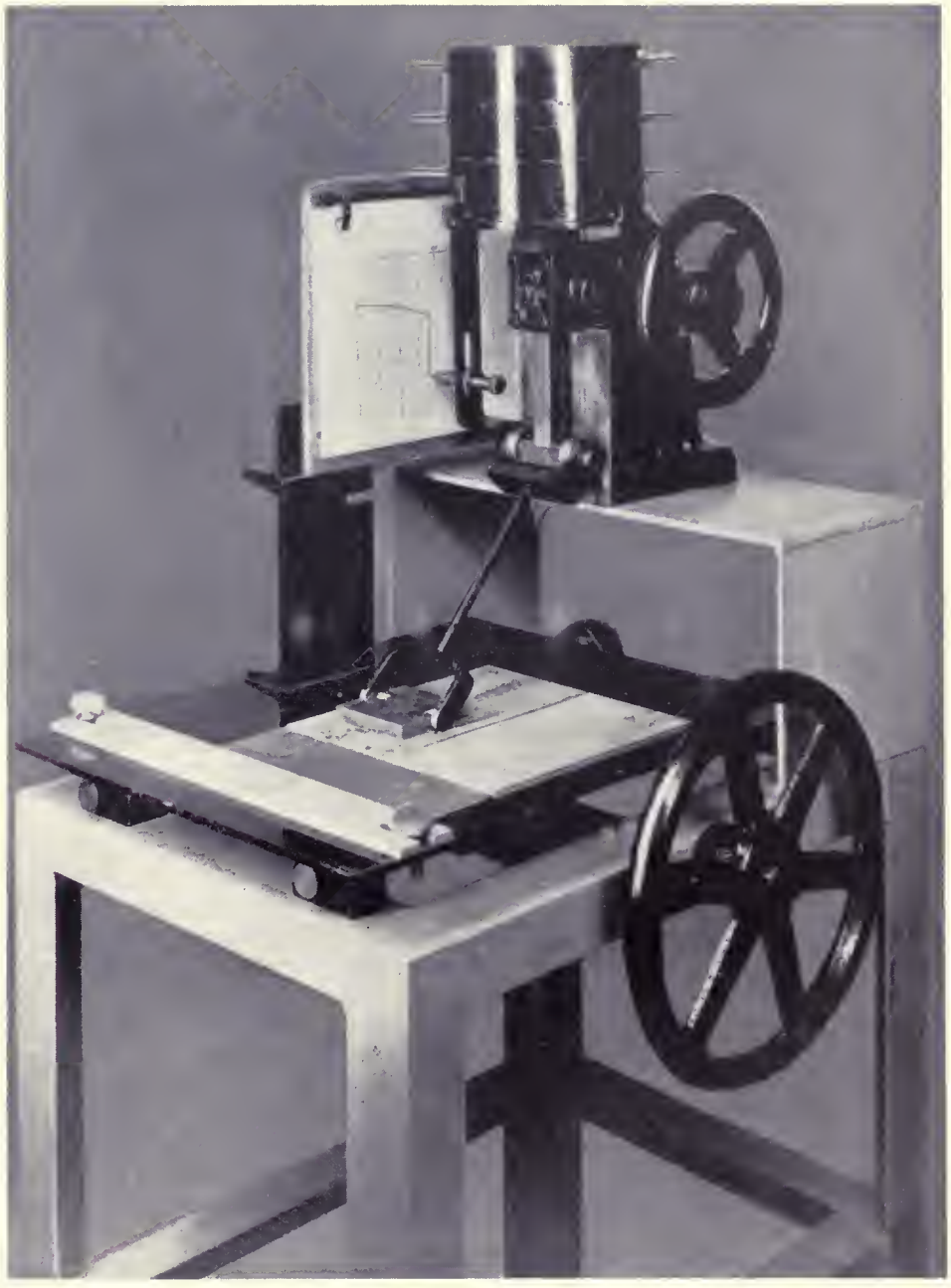
The above percentages relate to the 12 to 18 percent solid content of the liquid emulsion.

Some mention should be made of the wax free floor coatings. These are usually resin-based, and are generally used when slip resistance is the paramount consideration. In the past, the drawback has been that they are difficult to maintain, but they have found their uses in installations such as hospitals. However, the possibilities arising from the field of synthetic resins are almost limitless, and it is probably only a matter of time before resins especially applicable to floor wax will be developed. Even now certain resins give indications of being more satisfactory for this purpose than even Carnauba wax.

Laboratory Tests

Laboratory tests on floor wax are mainly concerned with film characteristics and nonslip properties. Unfortunately, chemical tests for composition are of little value. Colloidal silica may be accurately determined, but there is no satisfactory method for determining Carnauba wax, or for identifying resins once they are incorporated in the batch. Film characteristics such as gloss, waterspotting, removability, etc., are easily determined, but the film is best evaluated when applied on a large area of floor. Other tests usually performed are for stability, sediment, and alkalinity.

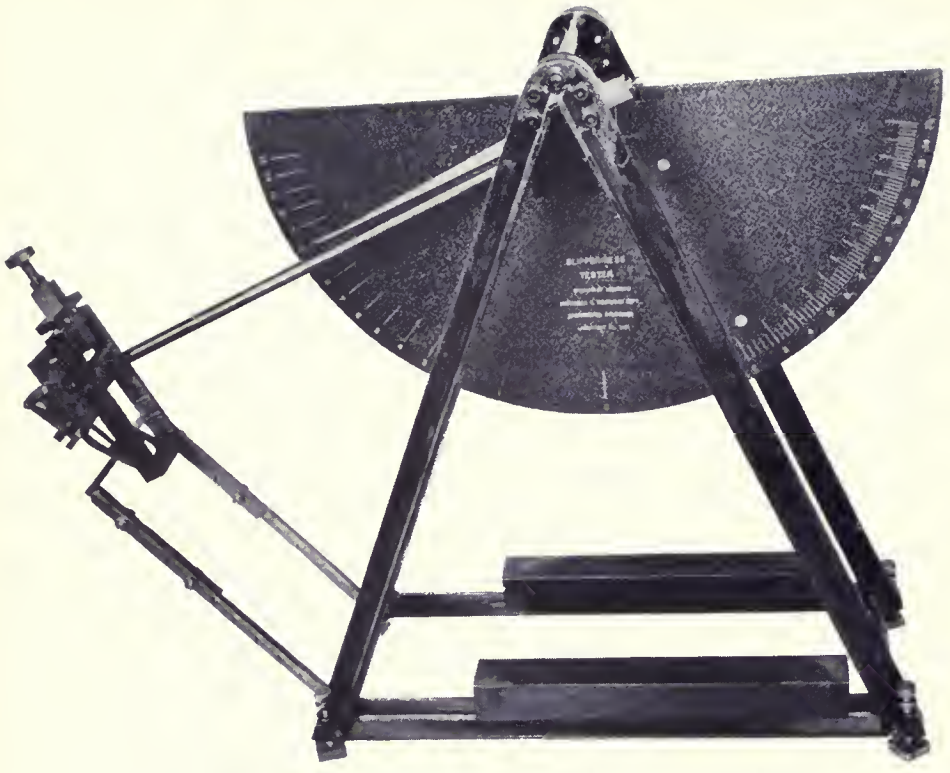
Attempts to evaluate slip resistance in the laboratory have proven fairly successful. Slip resistance tests are based on the measurement of either static or dynamic friction. The evidence is not conclusive as to which type of test will best evaluate a wax. Essentially, a static test measures the tendency to start slipping, while the dynamic test measures the tendency to continue slipping. The James machine used by the Underwriters Laboratory measures static friction. The coefficient of friction is determined from the angle at which slipping occurs. The tangent of this angle of friction is the coefficient of friction.



James Machine. Used by the Underwriters' Laboratory to measure coefficient of static friction of floor surfaces.

Impact Pendulum Tester

The National Bureau of Standards uses the Impact Pendulum Tester, designed by Percy A. Sigler. This is a dynamic test, measures the decrease in length of arc of a pendulum as the floor offers resistance to its swing. The coefficient of friction is calculated from the ratio between the decrease in potential energy and the work done on the floor. In these tests a static coefficient of 0.5 and a dynamic coefficient of 0.4 are considered necessary for a safe floor. The High-



National Bureau of Standards Impact Pendulum Tester for measuring coefficient of dynamic friction of floor surfaces

way Materials and Research Department has one of these machines which is used to determine the slip resistance of waxes used by the Division of Highways.

Another method, which has not yet achieved scientific recognition, is that of measuring the force necessary to pull a 10-pound bag of shot along the floor. This method is useful as a practical field test. It gives somewhat lower results than the other methods, a friction coefficient of 0.3 being regarded as safe.

The State of California purchases about 15,000 gallons of floor wax annually. Of this, about 1,000 gallons is used by the Division of Highways. The State Standards Committee on Janitorial Supplies has enlisted the cooperation of several West Coast manufacturers in the search for a wax that will be satisfactory to all concerned. The Service and Supply Department and the Materials and Research Department of the Division of Highways are cooperating in this study.

In Memoriam

ROWE S. HOLMAN

Rowe S. Holman's death while at work on August 5th was a shock to all of his fellow employees in District VII, who will always remember him as an extremely capable engineer and a dependable, willing worker with a wonderful personality, always ready to help others.

He was born February 27, 1890, at Rolla, Missouri. He graduated cum laude in civil engineering from the University of Idaho. After finishing college he worked for the Montana State Highway Commission for four years on various office and field assignments. When he left Montana he moved with his family to Huntington Park where he owned and operated a stationery and gift shop.

Mr. Holman wanted to get back into highway engineering and started with the State Division of Highways in June, 1936, in the Maintenance Department of District VII, where he worked until a short time before his death.

He handled in a highly commendable manner bridge repairs, design and construction of minor structure projects and repairs and additions to the maintenance stations. The huge freeway program interested him and he recently transferred to the Design Department to have a part in designing freeways.

He is survived by his wife, a son, two daughters and six grandchildren, to whom his fellow employees extend their sincere sympathy.

EXPERIENCE A HARD TEACHER

Experience teaches fools, says a Latin proverb, but foolish driving often makes the experience very costly. Take it easy, urges the California State Automobile Association, so you won't have to learn the hard way.

HITCH-HIKER DANGER

The FBI says the number of crimes involving hitch-hikers who have been picked up by the unwary motorist is increasing. You should avoid inviting anyone into your automobile unless you know the individual personally.

PRAISE FROM NEW YORK

State of New York
DEPARTMENT OF PUBLIC WORKS

Poughkeepsie, N. Y.

Mr. Kenneth C. Adams, *Editor*

Dear Mr. Adams: I do not think that I should return the attached post card without a word of appreciation for your magazine which I have been receiving ever since 1948. At that time I detoured from Salt Lake City to California to examine the Johnson finishing at the suggestion of the State Superintendent of Public Works, and through the courtesy of your department saw quite a lot of work in both the San Francisco and Los Angeles areas.

Your magazine could be interesting to anyone, but more interesting to me, having traveled through the areas of some of the improvements. The New York State Department of Public Works is a proud department, but we do not have a magazine, and it seems that your magazine is the leading departmental publication in this Country, or anywhere else for that matter. A little applause never hurts, they say, if it is sincerely offered.

Yours very truly,

J. S. Bixby
District Engineer

New Willard Bridge

A Federal Aid Secondary County Project in Ventura

By JACK SYLVESTER, Resident Engineer

THE CENTRAL feature of the Independence Day celebration at Santa Paula in Ventura County on July 5, 1920, was the opening of a bridge across the Santa Clara River. Completion of the structure was an accomplishment for several reasons. An opinion had been widely held that construction of a bridge across the river was a physical impossibility, as the nature of the river bed was such that winter floods would carry away any bridge constructed. In those days, where were construction funds to be obtained? It was a community route of travel, but it was not a county road. The City of Santa Paula was not endowed with resources sufficient to provide such a project. Oil fields were being developed in the mountains along the south bank of the river, but this development had not become an industry of such magnitude as would foster such an improvement. Obstacles deriving from financial paucity and nonresponsibility of ownership were overcome by the determination of those who would benefit from construction of the bridge.



Engineer's office being moved across old Willard Bridge over Santa Clara River at Santa Paula. Nate width did not permit trucks and busses to pass. Like Ventura County, many other counties have taken advantage of the Federal Aid Secondary Highway Program to remove such traffic bottlenecks.

Public Subscriptian Started

A drive for public subscription of funds was conducted. Farmers whose lands lay on the south bank contributed—one of them for instance gave $400—many of the oil field workmen gave $10 each. During 1919, the sponsors of the drive reported that the required sum would be complete if there were $7,500 more subscribed. That sum was then subscribed by Mrs. Harriett A. Willard, widow of Charles A. Willard, a local pioneer who had grown wealthy from oil-bearing lands. The bridge, at its dedication on that Independence Day in 1920, was named Willard Bridge in grateful recognition of Mrs. Willard's decisive contribution. The community was justly proud of its accomplishment in constructing the bridge, and oldtimers to this day who still live around Santa Paula believe their contributions to the original construction fund were well invested.

The original Willard Bridge was a series of combination Pratt trusses on reinforced concrete piers supported by reinforced concrete piles. A local newspaper said at the time of the dedication that the bridge was permanent, with its "abutments and piers sunk to eternal rock" and "its viaduct high above any record high water level." During construction, some of the problems affecting present-day jobs manifested themselves. Pile driving was difficult, as ledge rock lies near the surface of portions of the river bed. Steel was in short supply, and the newspaper reported delays to construction pending arrival of steel by railroad shipment. The bridge consisted of 10 spans, with a total length of 918 feet. It was constructed by William Ledbetter and Company at a contract price of $49,040. About a year after its completion, the bridge became the property of Ventura County and thus a part of the county road system.

In winter floods, Nature several times destroyed the north approach to Willard Bridge, as the north bank of the river was for a long time not well protected by levees, and the area is bottom land under high water, but a flood caused by the failure of St. Francis Dam on the night of March 13, 1928, carried away seven spans and thoroughly destroyed most of the piers, even breaking the piles deep in the river bed. The superstructure of the seven spans was beached along the river banks, and it has been said that one span was landed on the back porch at the home of the chief of police of Santa Paula.

The structure was promptly reconstructed at the expense of the City of Los Angeles, owner of the dam which failed. Portions of the structure which remained standing were repaired, and those lost were replaced by new construction. A good job was done on reconstruction of foundations, and creosote-treated deck planking was laid on the new truss spans. Reconstruction cost $34,140, and the Contractor was Oberg Bros., of Inglewood.

. . . Continued on page 54

Bayshore Freeway

New Section Between Army and Bryant Opened to Traffic

A NEW TWO-MILE section of the Bayshore Freeway between Army Street and Bryant Street in San Francisco was opened to traffic on October 1st.

The completed project, representing two separate contracts, has taken two years to construct.

The first contract, awarded in August of 1951, covered the construction of seven-tenths of a mile of six-lane divided freeway between 18th and Bryant Street. All of this section of the Bayshore is elevated some 20 feet above ground level.

The second contract, on which work began in March, 1952, covered the 1.3 miles between Army Street and 17th Street. In addition to construction of the freeway itself, this project also involved the construction of pedestrian overcrossings at 25th, 22d and 18th Streets and a 122-foot bridge to carry cross traffic and pedestrians over the freeway at 23d Street.

Right of Way Costs

Nearly half of the over-all $9,312,000 cost of the two projects was for the purchase of right of way, involving the extensive removal or relocation of major public utilities facilities such as railroad tracks, sewer lines, water mains and power and telephone installations.

One of the most difficult problems was the relocation of certain City of San Francisco high pressure water lines which are used exclusively for fire protection. The work involved careful planning, because the water could be shut off for short periods only on account of the fire hazard.

Opening of the Army-Bryant section will mean an unbroken stretch of freeway between Alemany Boulevard and Bryant Street, a distance of three miles. It will liberate thousands of motorists from the congestion which has prevailed on Potrero Avenue.

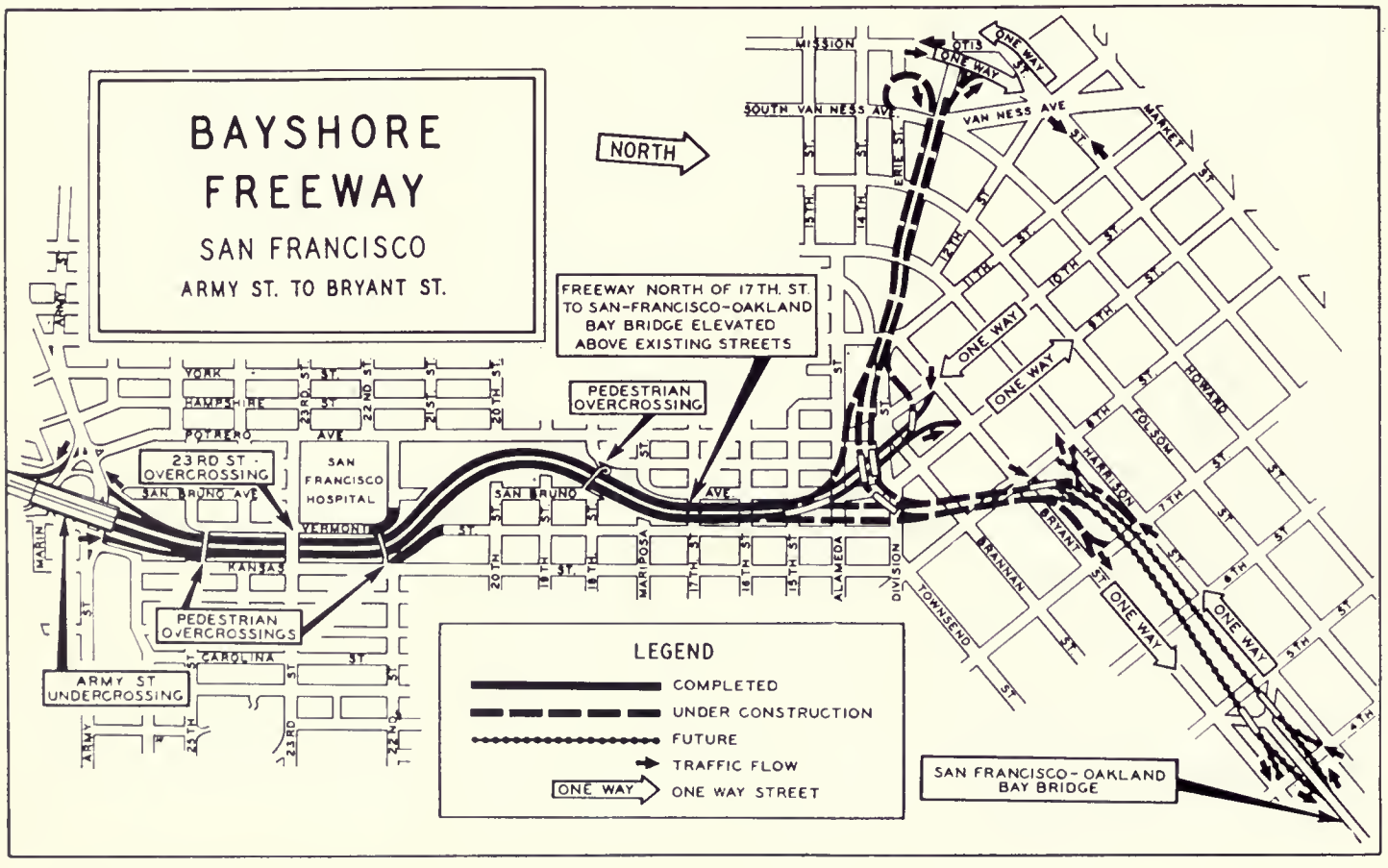
Three Other Contracts

The 1.7-mile section from Alemany Boulevard south to Third Street is now under construction and is slated to be completed sometime early in 1955.

Three other contracts, now in progress, will extend the freeway viaduct north to Seventh Street and west along 13th Street to Mission Street.

In addition, bids will be opened on September 30th for construction of most of the remaining portion of the

. . . Continued on page 56



Recommendations

San Francisco and Alameda Counties Submit Projects to Highway Commission

HIGHWAY projects recommended for inclusion in the 1954-55 budget were submitted to the California Highway Commission at its September meeting in Sacramento by the San Francisco Chamber of Commerce and by the Alameda County Highway Advisory Committee. In addition to projects eligible for construction and right of way allocation, San Francisco presented three major projects for plans and surveys.

The San Francisco jobs recommended for early construction are:

Route 68—Bayshore Freeway: Third Street to Fifth Street, 0.2 mile, $1,200,000; South City Line to Salinas Street, 1.0 mile, $1,300,000.

This financing will permit completion of the Bayshore Freeway in San Francisco.

Route 68—Bayshore Freeway: South City limits to connection with existing Bayshore Freeway near South San Francisco, 3.5 miles, $6,000,000.

Open water section, though located in San Mateo County, is of urgent need to San Francisco as the principal link to the Peninsula working areas and residential areas as far as San Jose. Traffic count: 45,000 to 50,000 per day.

Route 224—Embarcadero Freeway: San Francisco-Oakland Bay Bridge via Embarcadero to Broadway (portion), 1.3 miles, $23,100,000.

This route will promote distribution of traffic to and from the financial district and the waterfront industrial areas, and to a Southern Bay Crossing.

Route 2 and 223—Central and Panhandle Freeways: Connection from Bayshore Freeway, near 13th and Mission Streets, across Market Street to Panhandle Freeway in vicinity of Fell, Oak, and Turk Streets, 0.9 mile, $12,500,000.

This will permit concentrated traffic volumes, generated by the western community areas of the city, to connect with the Bayshore and thence to the downtown metropolitan district, to the San Francisco-Oakland Bay Bridge, and the Southern Crossing.

Recommended for plans and surveys are the following projects:

Route 224—Embarcadero Freeway: From Broadway to Van Ness, 1.7 miles.

The Embarcadero Freeway is in part the eastern side of the central distributor loop, and in part a radial

Guests at luncheon given by San Francisco Chamber of Commerce under direction of Robert M. Shillito, Assistant General Manager of Chamber. STANDING—George T. McCoy, State Highway Engineer; Chester H. Warlow, State Highway Commissioner, Fresno; G. L. Fox, General Manager, San Francisco Chamber of Commerce; Frank B. Durkee, Chairman, State Highway Commissian, and Director of Public Works; Leonard S. Masias, Chairman, Traffic and Highway Section, San Francisco Chamber of Commerce; H. Stephen Chase, State Highway Commissioner, Sacramento; Carroll Newburgh, Chairman, Freeways Subcommittee, Traffic and Highway Section, San Francisco Chamber of Commerce; F. Walter Sandelin, State Highway Commissianer, Ukiah. SEATED—Left Table, Left Side—R. C. Kennedy, Secretary, California Highway Commissian; J. C. Womack, Planning Engineer; Fred Bagshaw, Special Assistant to Director of Public Works; J. E. Jellick, Member Traffic and Highway Section, San Francisca Chamber of Commerce; Russell S. Munro, Deputy Director of Public Works; Sherman P. Duckel, Director, Department of Public Works, City and County of San Francisco. SEATED—Left Table, Right Side—Radney C. Richardson, Assistant to Director of Public Works; G. N. Cook, Assistant Secretary, California Highway Commissian; F. W. Panhorst, Assistant State Highway Engineer; Loran C. Vanderlip, Director, Transportation and Highway Department, California State Chamber of Commerce; B. W. Booker, Assistant State Highway Engineer, District IV; J. H. Sembower, member, Traffic and Highway Section, San Francisca Chamber of Commerce. SEATED—Right Table, Left Side—Max Gillis, Special Representative to Director of Public Works; William Claytan, Manager, Sacramento Valley District, California State Chamber of Commerce; J. P. Murphy, Principal Highway Engineer; Richard H. Wilsan, Assistant State Highway Engineer; Assemblyman Charles W. Meyers, 19th District, San Francisca. SEATED—Right Table, Right Side—Kenneth C. Adams, Editor, California Highway and Public Works; C. E. Bavey, Engineer of City and Caaperative Projects; George S. Pingry, Assistant Chief, Right of Way Department, District IV, San Francisca; H. V. Starr, Secretary, Traffic and Highway Sectian—Manager, Civic Development Department, San Francisca Chamber of Commerce; F. C. Balfaur, Chief, Right of Way Agent; Frank Lombardi, City Planning Department, San Francisco; R. M. Gillis, Deputy State Highway Engineer; Ralph Wadsworth, City Engineer, San Francisco.



bypass route serving traffic. Plans and surveys are requested for that portion from Broadway to Van Ness to and from the Golden Gate Bridge.

Route 223 — Panhandle Freeway: From Route 2 to Route 56, 2.3 miles.

The Panhandle Freeway is a radial route to the west and a most important element in the traffic circulation plan. Passing between and serving the Western Addition and Buena Vista community areas, it extends from the Civic Center westward as the principal artery to the Park Presidio, Richmond and Sunset community areas, as well as a bypass route to the Golden Gate Bridge.

Route 56 — Junipero Serra, Park Presidio: From South City limits to Golden Gate Park Junction with Route 223 Panhandle Freeway and to Golden Gate Bridge, 6.5 miles.

This route is in part a direct bypass connection between the northern and southwestern gateways to the city, and in part a radial extension of the Panhandle Freeway. Designed as a freeway to serve the crosstown function of 19th Avenue after its capacity is reached, this route, by utilizing the 200 foot right of way of Junipero Serra Boulevard, will also divert traffic around the San Miguel Range, of which Twin Peaks is a major feature, via the Panhandle Freeway to the downtown metropolitan district, and via the Park Presidio Freeway to the Golden Gate Bridge.

The recommendations were presented by Leonard S. Mosias, Chairman, Traffic and Highway Section, San Francisco Chamber of Commerce. Following its annual practice, the San Francisco chamber tendered to the members of the Highway Commission and engineers of the Division of Highways a luncheon at the Sutter Club in Sacramento on September 16th and on the following day made its official presentation.

Headed by Supervisor Harry Bartell, a delegation representing the Alameda County Highway Advisory Committee submitted the following projects for inclusion in the next highway budget.

State Route 69—East Shore Freeway: (1) Accelerate stage construction between Fallon Street and the Bay Bridge Distribution Structure. (2) Accelerate stage construction to provide more adequate facilities northerly of the Bay Bridge Distribution Structure to the Alameda-Contra Costa County boundary. (3) Initiate construction from Jackson Street southerly.

State Route 226: (1) *Estuary Crossing.* If construction is not started in the fiscal year 1953-1954 out of Toll Bridge Authority Funds that construction be started utilizing State Highway Funds, and that any highway funds used for this estuary construction be returned to Alameda County highway allocations from Bay Bridge bond funds. (2) *In Alameda.* Initiate construction from northerly end of Bay Farm Island Bridge to Fernside Boulevard in Alameda.

State Route 227—Mountain Boulevard Freeway: Continue program of allocation in conjunction with Joint Highway District No. 26. It is recommended that the annual allocations be materially increased.

State Route 5: (1) *Foothill Boulevard.* Complete rights of way acquisition and design and construction from Castro Valley Junction to Hayward. (2) *Between Castro Valley and Dublin.* Construction of freeway from western end of present construction about two miles west of Dublin to Castro Valley.

State Route 228: Initiate construction.

Projects upon which expenditures should be made for planning, surveys, designs, acquisitions, and protection of rights of way during the fiscal year 1954-55, Bartell said, are:

State Route 69—East Shore Freeway: Rights of way purchases should be continued on sections not programmed for construction.

State Route 226 and 75—in Oakland, Alameda and San Leandro: (1) Definite location of these routes in Oakland should be made giving full consideration to the proposed Richmond Boulevard route. Planning and surveys should be initiated and a program formulated for correcting spot deficiencies. (2) Surveys and plans for widening, improving and grade separations from Bay Farm Island Bridge to Route 105 in San Leandro.

State Route 105—in Oakland, San Leandro and Hayward: (1) Surveys and plans for correcting spot deficiencies from High Street southeasterly involving consideration of rerouting making use of San Leandro Street and Boulevard and extending San Leandro Boulevard to connect with East 14th Street (State Route 105) in the vicinity of 136th Avenue. (2) Surveys and plans from Route 5 to Route 69 and a program formulated for correcting spot deficiencies.

State Route 5—MacArthur Boulevard and Foothill Boulevard: (1) Complete purchases of rights of way for the initial section of the MacArthur Boulevard Freeway preparatory to construction in the 1955-1956 fiscal year. (2) Complete surveys and commence protection of rights of way for the remainder of MacArthur Boulevard through Oakland and San Leandro. (3) Make surveys and commence protection of rights of way in San Leandro to Route 228.

State Route 206—in Berkeley: Funds be provided to complete study of route locations.

State Route 233—in Oakland: (1) *High Street.* Surveys and plans and purchase of rights of way from Route 69 to Route 5. (2) *Park Boulevard Extension.* Surveys and plans and purchase of rights of way from Route 227 to county line with corresponding action in Contra Costa County.

THANK YOU

JACK AMMANN
PHOTOGRAMMETRIC ENGINEERS

California Highways and Public Works

GENTLEMEN: I would like to take this occasion to thank you for your cooperation in sending three of your recent journals that included articles on photogrammetric mapping or the use of such maps.

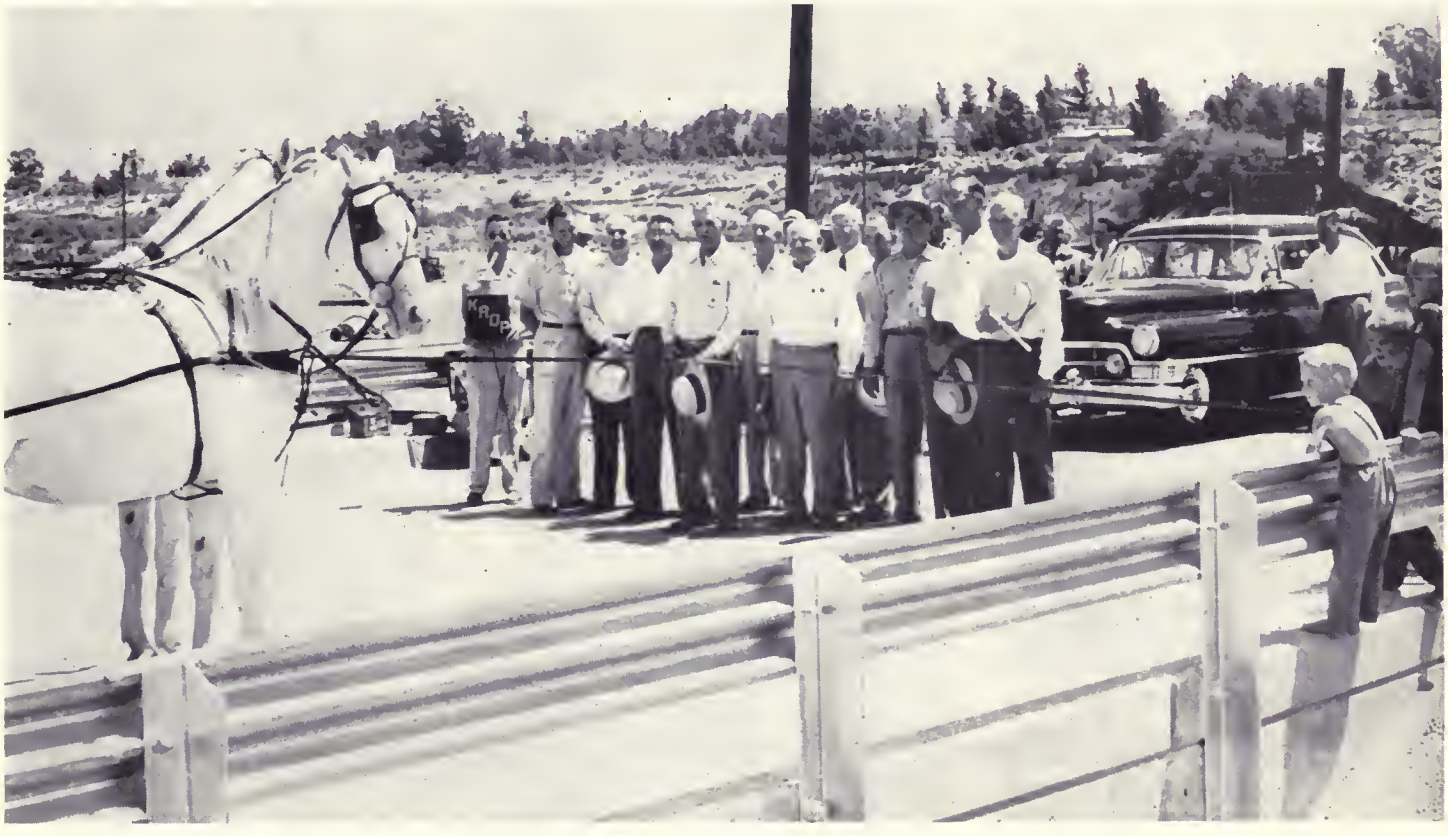
Your publication is most interesting and the best medium of highway information that is published by a state highway department that I have seen. Congratulations on producing such a worthwhile magazine.

Very truly yours,

JACK AMMANN PHOTOGRAMMETRIC ENGINEERS
WM. H. MEYER
Eastern Manager

NEW BRIDGE AND HIGHWAY OPENED AT BRAWLEY

By E. E. WALLACE, District Engineer



On July 17, 1953, citizens of Brawley and Imperial County assembled on the new bridge across New River north of Brawley and officially opened the structure on U. S. 99.

The ribbon was cut by Senator Ben Hulse and he was assisted by Assemblyman J. Ward Casey, Mayor Victor McClain of Brawley, Supervisors Osborne and Cavanah, together with representatives from the Brawley Chamber of Commerce, the State Division of Highways and others.

Following the cutting of the ribbon, the new bridge was crossed first by a beautiful team of white horses driven by Ben Martin, pioneer of Imperial Valley, who forded the New River before the existence of bridges in this area, and next, by a modern automobile occupied by several of the officials.

The project provided for the construction of two parallel reinforced concrete bridges 198 feet in length and each structure 28 feet in width, which provided a four-lane divided highway across the river, together with the four lanes of paved highway on the approaches and a divided highway through Brawley to the south city limits, covering a total length of one and three-fourths mile.

Replace Old Span

The bridges replaced an old narrow two-lane timber structure which was severely damaged in the 1940 earthquake. At that time, several spans of the old bridge were shifted one and one-half feet and one of the caps was moved completely off of the pile supports. The approaches shifted and settled several feet and it was necessary to detour traffic for a week while repairs were being made.

The completed project provides a much needed improvement and will result in a reduction in accidents as well as a more convenient and less congested highway to and through the City of Brawley.

The accompanying photograph shows the ribbon-cutting ceremony. Those in the foreground reading from left to right are: Bob Scott, Radio Station KROP, Brawley; Williams A. Dillard, President of the Brawley Chamber of Commerce; Rev. Father Henry Keen; Victor McClain, Mayor of Brawley; State Senator Ben Hulse; Supervisor Hugh Osborne; Assemblyman J. Ward Casey; E. E. Wallace, District Engineer, State Division of Highways; Supervisor Neil Fiefield; Supervisor Earl E. Cavanah; Frank Jorgensen, Assistant District Engineer, State Division of Highways; and Carl Jacobson, Brawley Chamber of Commerce.

Design Standards For County Roads

ADOPTION of a set of recommended design standards for county highways was one of the principal actions taken by the County Engineers Association of California at its 38th annual meeting, held September 10th-12th at Lake Tahoe.

Besides the election of officers for the coming year, other important business included the appointment of a committee to continue the study of standards for county highways and for subdivision streets as well.

The following officers were elected: Joseph H. Mack, San Diego County, president; Oliver C. Wyllie, Calaveras County, vice president; Harold Sprenger, Orange County, secretary; E. R. Hanna, San Benito County, and A. C. Keith, Riverside County, directors.

The opening day's session was spent in a joint meeting with the County Supervisors Association of California, during which problems common to both organizations were discussed.

Retiring President A. L. Kiefer, Sacramento County, presided at the opening session of the engineers' meeting on September 11th. Prof. Harmer E. Davis, director of the Institute of Transportation and Traffic Engineering of the University of California, addressed the group at the closing session. His subject was "Highlights of the Past Year at the Institute."

Other matters taken up included panel discussions on federal-aid secondary highway projects, geometric design, structural design, testing of materials, the land surveyor's act and the two-way radio as it is being used for highway maintenance and administration.

PATRICKS POINT STATE PARK

Patricks Point State Park, located on the Redwood Highway in the Humboldt County area, is reported by the National Automobile Club to have a rugged coast line, agate beach, and a variety of wild flowers, including azaleas and tiger lilies.

Highway Engineer Wins Tennis Championship



Clyde Hippenstiel in action on tennis court

CLYDE HIPPENSTIEL, a member of the Division of Highways staff in the San Bernardino District Office, recently spread the fame of California highways into the field of sports by winning the National Public Parks Tennis Championships held at Minneapolis, Minnesota, August 16 to 23.

In recapturing the national title he had held in 1950, Hippenstiel didn't drop a single set in sweeping through five opponents. Employing a strong service and aggressive net rushing tactics, he thumped both the 1951 and 1952 champions on his way to the title.

In a rugged two and one-half hour semifinal match, the Californian dumped Wade Herrin of Birmingham, Alabama, winner in 1951, by scores of 6-4, 9-7, 11-9, and then proceeded to swamp Defending Champion Linn Rockwood of Provo, Utah, in the final round 7-5, 6-2, 6-0. Hippenstiel's other victims were

. . . Continued on page 49

PROMOTIONS FOR BRIDGE ENGINEERS

STATE HIGHWAY ENGINEER George T. McCoy announced the following promotions and assignments in the Bridge Department of the Division of Highways effective August 1st.

A. L. Elliott, Assistant Operations Engineer—Bridges, promoted to Bridge Engineer—Planning.
J. E. McMahon, Supervision Bridge Engineer, promoted to Bridge Engineer—Southern Area, with headquarters in Los Angeles.
Stewart Mitchell, Bridge Engineer—Planning, assigned to the position of Bridge Engineer—Special Studies.
I. O. Jahlstrom to continue in his present assignment as Bridge Engineer—Operations.



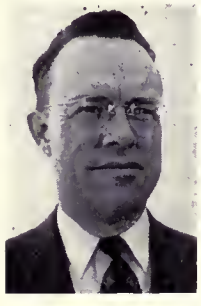
A. L. ELLIOTT

Elliott, who has been with the Bridge Department of the Division of Highways since 1936, was born in Seattle, Washington, and attended the University of Washington, graduating in 1933 with a degree in civil engineering. After several years with the U. S. Bureau of Public Roads on various Pacific Coast projects, he served as construction engineer on the San Francisco-Oakland Bay Bridge prior to entering state service. He is a member of the American Society of Civil Engineers.

Elliott, who resides at 3010 10th Avenue in Sacramento, is married and has two children.

Worked on Bay Bridge

McMahon was born at Chebanse, Illinois, and attended Marquette University and the University of California, graduating from the latter school in 1931 with a B.S. degree in civil engineering.



J. E. McMAHON

He has been with the Division of Highways since 1931. He was an engineer on the San Francisco-Oakland Bay Bridge from 1933 to 1936, after which he joined Bridge Department. He was appointed construction engineer for the southern section in 1951.

During World War II, he served as a commander with the Civil Engineering Corps of the U. S. Navy.

McMahon, who lives at 279 Santa Ana Avenue in Long Beach, is married and has a daughter.

He is a member of the American Society of Civil Engineers.

New Assignment for Mitchell

Mitchell came to work for the Bridge Department in 1924 and was appointed Bridge Engineer—Planning, in 1947.



STEWART MITCHELL

He was born in Belfast, Ireland, and came to the United States as a young boy of four. He attended Purdue University, graduating in 1908 with a B.S. degree in engineering. During World War I he served in France as a captain in the 306th Engineers.

Mitchell's new assignment actually is the expansion of a function with which he has been identified for many years. The accelerated program of state highway improvement requires special studies and reports on many bridges and other major structures.

Mitchell, who lives at 2625 Rochon Way in Sacramento, is married and has two sons. He is a past president of the Sacramento Section of the American Society of Civil Engineers, and Past National Chairman of the Structural Division of the Society's Executive Committee.

ONE OF OLDEST TOWNS

San Miguel Del Bado is one of the oldest towns in New Mexico, according to the National Automobile Club. Its church was constructed by the Indians of the parish under direction of the priests in 1806.

Jahlstrom's Job

Jahlstrom was born at Astoria, Oregon, and holds a B.S. degree in engineering from Washington State College, and an M.S. degree from the University of Illinois.



I. O. JAHLSTROM

He came to work for the Bridge Department in 1928 and was appointed Bridge Engineer—Operations, in 1947. He is responsible for both construction and maintenance of state highway bridges.

He served in the U. S. Navy during World War I.

Jahlstrom, who resides at 2783 Harkness Way in Sacramento, is married and has two children. He is a member of the American Society of Civil Engineers.

Tennis Champion

Continued from page 48 . . .

George Johnston of Flora, Illinois; John Holden from San Francisco; and Jerry Glade of Salt Lake City.

To add to his singles title, Hippenstiel teamed with Mary Prentiss, also from San Bernardino, to capture the mixed doubles championships.

Hippenstiel, Assistant Engineer of City and County Cooperative Projects in the District VIII office, has been with the Division of Highways seven years, all in the San Bernardino area. During the Minneapolis tournament, his connection with the State Highway Department was widely publicized throughout the country by the various news wire services.

Retirements *from* Service

J. M. Harlan

On October 1, Jacob Melick Harlan, head of the San Diego office of the Division of Architecture, wound up 27 years of State service by retiring. This record is an enviable one.

Born in Rincon, New Mexico, on October 17, 1888, he attended the public schools of New Mexico and the New Mexico Military Institute, graduating in 1907 with a major in engineering and a minor in Spanish. He is the son of James A. Harlan and Lulu (Melick) Harlan. The elder Harlan was a construction engineer for the Santa Fe railroad and afterwards was in business as a general contractor. Upon graduating, Harlan went into partnership with his father in the general contracting business of J. A. Harlan & Son. This firm was in business from 1907 to 1916. It engaged in the building of practically everything from house construction, through commercial building, construction work for the Santa Fe railroad, powerhouse stacks, and chimneys to bridges.



J. M. HARLAN

Goes to Central America

In March, 1916, Harlan went to Central America as engineer in charge of the location and construction of a mining railroad for the Eden Mining Company, Bluefields, Nicaragua, on the Mosquito Coast of Nicaragua. He was with this company until July, 1918, returning to the United States for war duty. He was appointed Captain of Engineers, but the armistice was signed before he took up service. After spending some time in San Francisco, he went to the Imperial Valley and was from December, 1918, to May, 1919, a pile driver foreman for the Imperial Irrigation District. Returning to San Francisco in 1919, he went to work as chief estimator at the Shaw-Badger Shipyard of Western Pipe and Steel Company. He served there until June, 1921. After a few months of unemployment, he went to the High Sierras in October, 1921, where he built a mill and several mining buildings for a mine company headed by the automobile dealer, Don Lee.

Superintendent of Construction

Harlan served as superintendent of construction for the Davidson Construction Company in Los Angeles from early 1922 to late 1923, and from December, 1923, until June, 1925, was employed in the same capacity for R. E. McKee. While a superintendent for McKee, he constructed the buildings for the Naval Hospital in Balboa Park in San Diego and the Santa Fe railroad shops in San Bernardino. From June, 1925, to May, 1927, he was in charge of the reconstruction of 15 buildings destroyed by the earthquake in Santa Barbara for the Mattock & Feasey Contractors of San Francisco.

Some time during the year 1925 Harlan had taken a state civil service examination for Estimator of Building Construction, Grade IV, which was the equivalent of our present Senior Estimator. In those days the Division of Architecture was a small organization employing less than 75 individuals and two years elapsed before a vacancy occurred. In September, 1927, he joined the division. He was assigned to the San Diego office in September, 1929, and has headed the San Diego District under various titles (Superintendent of Building Construction from 1929 to 1931; Senior Engineer of General Construction from 1931 to 1941; Senior Construction Inspector from 1941 to 1948; Senior Construction Supervisor from 1948 to 1950; and District Construction Supervisor since 1950, except for the period of February, 1943, to December, 1944, when, due to wartime curtailment of work, the division closed the San Diego office). During this period, Harlan did engineering and construction work for several contractors in the San Diego area on various war construction jobs.

Erected San Diego College

The jobs that Harlan has done for the State while heading the San Diego District include the erection of the entire San Diego State College. He moved into the new site after the first survey crew and has seen the plant through from the chasing off of rattlesnakes so that the contractors could begin excavation to the completion in 1953 of the 12 latest buildings, which include among others the industrial arts and arts and crafts building; science building addition which contains one of the three planetariums attached to a state college in the United States; a complete training school, library and science, physical education, and academic buildings.

This campus now consists of buildings valued at nearly $4,000,000 with $1,100,000 of additional construction currently under way. Harlan has also built everything from border inspection stations at Winterhaven, Blythe, and Vidal Junction; fairs at Imperial and Del Mar; highway office buildings (having built both the old and new highway buildings in San Diego), to armories in San Diego, National City, El Cajon, El Centro, Calexico, Hemet, Vista and Coronado; and many other buildings. During those years he has been in charge of construction, the grand aggregate amounts to slightly in excess of $10,061,657. Of this, $2,064,625 is currently under construction. In the course of the years Harlan has supervised more than 400 individuals on state forces.

Most Motorists Ignore Speed Limit Signs

Speed limit signs alone are not the answer to slowing down traffic on California highways.

This is the conclusion of the State Division of Highways after experimenting with the posting of 55-mile speed limit signs at eight locations on the Bayshore Freeway and U. S. 99. The test was part of a continuing cooperative effort by the Division of Highways and the California Highway Patrol to increase highway safety.

"The signs appeared to have no appreciable permanent effect upon the speed of motorists," says George T. McCoy, State Highway Engineer.

He added that in a few instances the signs had slowed down traffic a fraction of a mile an hour just after they were posted, but that in a year or so the prevailing speeds had climbed right back up to where they were before and then some.

For example, on U. S. 99 between Madera and Fresno, where a large proportion of motorists go a little faster than the 55-mile an hour state prima facie speed limit, the following trends were observed.

Fresno and Madera Examples

Near the south city limits of Madera the speed remained approximately the same just after the posting of the signs, but in a year's time had increased more than one mile an hour.

Near the north city limits of Fresno motorists slowed down by nearly one mile an hour just after the signs were posted, but one year later had speeded up again to a point nearly a mile an hour faster than before the signs were placed.

And apparently large, reflectorized signs are no more effective in slowing down traffic than the standard signs.

On Bayshore Highway

On the Bayshore Highway, where congestion is greater than on U. S. 99 and speeds tend to be closer to the 55-mile an hour limit, the posting of additional over-sized reflectorized signs showed the following:

At East Willow Road south of Menlo Park the speed actually increased one-half mile an hour just after the posting of the signs and in two years' time had increased another two and one-half miles an hour.

Near Brokaw Road just north of San Jose the speed also increased over one mile an hour immediately after the posting of the signs. Two years later speeds had decreased about two miles an hour, but engineers point out any drop in speed is more probably due to the growing congestion along this section of the Bayshore rather than a belated observance of the signs.

The Division of Highways engineers concluded that, on the basis of their survey, there seems to be little justification for the contention that more frequent posting of 55-mile speed limit signs would reduce speeding on our highways.

Tough Survey

Continued from page 18 . . .

strewn channel, and is fordable only with extreme difficulty. The velocity precludes taking soundings, and cross-sections have been taken by a rodman in swimming trunks, hanging onto a rope with one hand, a rod with the other, and with a tape in his teeth.

In spite of these and other difficulties, including two feet of snow, the survey has been completed, and the design is being pushed so that right of way may be purchased. As soon as funds are available, the construction will be done, and an ancient relic of the horse and buggy, or more probably horse and sled, days will have been eliminated.

The work has been carried on under the direction of District Engineer Alan S. Hart and his successor in District IX, Milton Harris. Immediate supervision has been by District Design Engineer J. H. Creed. Several different field parties have worked on the project.

In Memoriam

JOSEPH M. CURRY

Joseph M. Curry, watchman with the Division of Highways in District VII, Los Angeles, passed away on August 3, 1953, as a result of coronary thrombosis.

Mr. Curry was born June 4, 1908, in Elizabeth, Pennsylvania. He was a veteran of World War II. He started to work with the Division of Highways on July 9, 1950, as a night watchman and parking lot attendant.

Those who park in the Second and Spring Street lot will miss Joe Curry's affable and pleasant greeting. He had no immediate family in California, but is survived by his mother who resides in Cleveland, Ohio.

In Memoriam

GEORGE E. BROMM

Masonic funeral services were conducted for George E. Bromm at the Emerson-White Funeral Chapel in Whittier on August 15, 1953. Interment took place at Rose Hills Memorial Park.

Mr. Bromm was born in Topeka, Kansas, June 14, 1886. He came to California in 1912. Entering civil service in 1920, he worked for El Dorado County at Placerville for 10 years. In 1930 he accepted employment with the State Division of Highways at Sacramento Headquarters, working in the capacity of Heavy Equipment Mechanic. Later he transferred to District V, District II and District I. In 1946 he took over the maintenance of traffic signals for District VII, where he was Supervising Highway Traffic Signal Technician until his retirement in June of 1953.

His loss is deeply felt by the Division of Highways where he was well known, sincerely liked and a friend to all. Mr. Bromm is survived by his wife, Martha.

Leucadia Highway Improvement Is Now Completed

By J. FRANK JORGENSEN
Assistant District Engineer

Showing steel guard railings and trees left standing on highway through Leucadia

A STATE HIGHWAY contract was completed in September through Leucadia on U. S. 101 in San Diego County. This 2.2 mile improvement, costing $86,700, consisted of constructing turning lanes at public road connections, and placing steel guard railing along the center division strip and at various locations along the east side of the highway. Trees which interfered with this construction, obstructed visibility or were located too close to the pavement for safety, were removed.

The State Division of Highways has been concerned for several years at the increasing accident rate in the Leucadia area. Records show that, over a five-year period ending in 1951, a total of 164 auto accidents occurred. In the past year alone, seven traffic deaths occurred. It was also noted from the records that 50 percent of the accidents involved trees, and that another 16 percent involved rear end accidents due to left turns. The study showed that three-fourths of the accidents involved northbound vehicles.

Several attempts in the past have been made to improve the safety of this road. Double stripes were painted, reflectorized guide posts were installed, a 45-mile speed zone was established, and a few of the more hazardous trees were removed. All of these improvements were of value, but it was necessary to provide more extensive protection to traffic.

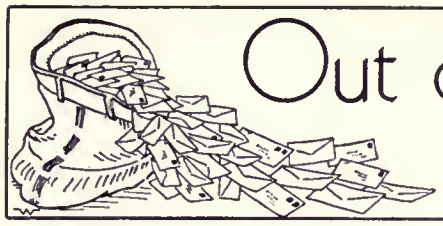
The Highway Commission appropriated the necessary funds for this project and a contract was awarded to J. E. Roberts, of San Bernardino, on May 20th of this year. In addition to the construction of turning lanes, some 10,000 feet of steel guard

. . . Continued on page 53









Out of the Mail Bag

MAGAZINE PUT TO GOOD USE

COUNTRY ROAD BOARDS
Exhibition Building
Rathdown Street
Carlton. N. 3.

Victoria, Australia

The Editor,
California Highways and
Public Works

DEAR SIR: It is just a shade over 26 years since I called at the Office of the State Highway Commission, as it then was, and saw the then Chief Engineer, Mr. Morton, and others. Mr. Morton was good enough to put me on the mailing list for "California Highways" and I have received copies regularly ever since, and for some years two copies—one for my own personal file and one for the library.

The publication is one of the best of its kind in the world, and is always eagerly sought after by our construction and other engineers who make full use of the technical articles. The descriptions of limited access highways and the very practical articles dealing with methods of assessing compensation to be paid adjacent land owners are most valuable and when public opinion in this country has been educated to the need for limited access highways, this wealth of information will be of great assistance, firstly in drafting the necessary legislation and subsequently in administering it. Unfortunately, that time has not yet arrived but we still live in hope.

With kind regards and wishing you and your Commission continued success,

Yours sincerely,

J. MATHIESON
Deputy Chief Engineer

THANK YOU, WALT FRATES

PORT OF OAKLAND
General Offices: Grove Street Pier
Oakland 7, California

MR. KENNETH C. ADAMS, *Editor*

DEAR MR. ADAMS: I have been a faithful reader of *California Highways and Public Works* for some time now, and I cannot resist writing you and congratulating you on what an excellent job you are doing with the publication in keeping the general public abreast of the manifold outstanding activities of the Division of Highways. We find the magazine a valuable addition to our files here at the Port of Oakland.

Also please convey our congratulations to our old friend R. C. (Cass) Kennedy, Secretary of the Highway Commission on his very interesting articles on the early days of the Highway Commission.

Kindest personal regards.

Sincerely,

J. WALTER FRATES
Public Relations Director

FINDS MAGAZINE USEFUL

CALIFORNIA STATE AUTOMOBILE ASSOCIATION
General Offices
150 Van Ness Avenue
San Francisca 2, California

MR. KENNETH C. ADAMS, *Editor*

DEAR MR. ADAMS: Attached is the post card authorizing you to continue our name on your mailing list to receive your very excellent magazine *California Highways and Public Works.*

We find the magazine to be not only interesting and informative, but exceedingly valuable to us as a reference work.

Yours sincerely,

CALIFORNIA STATE
AUTOMOBILE ASSN.
C. H. A. DUKE, Manager
Touring Bureau

Leucadia Highway

Continued from page 52 . . .

railing was constructed and guide posts installed. Many trees which did not require removal were trimmed, and 219 oleander bushes were planted for beautification as well as providing a headlight screen.

Highway officials believe that this improvement will substantially reduce the number of serious accidents, since the danger of crashing into trees has been reduced and the hazard of rear end collisions resulting from left turns has been lessened by the turning lanes. At least one serious injury or death has already been averted by the protective railing at the trees, and there is no record of any rear end collisions since the completion of the work. The highway thus remains a beautiful tree and shrub-lined road with important safety features added.

Jamboree

Continued from page 39 . . .

provisional troops that receive intensive training to improve camping techniques, learn more about cooking, and, in general, to make better campers of themselves. This training prepares them to be more self-reliant and better citizens.

The 1953 Jamboree was the largest exposition of the scouting program ever held on the West Coast. It was attended by a large number of visitors. A total of 44,000 cars were parked in the parking lot on the grounds between July 17th and July 23d. The largest number parked in one day was about 10,000 vehicles on Sunday, July 19th.

Everyone who had a part in the various activities and construction projects that were necessary to make this camp a success should feel proud of this association.

STAY ALERT AND STAY ALIVE

A moment's relaxation from watching the road while driving may result in an accident, warns the National Automobile Club. Stay alert and you will stay alive.



New Willard Bridge at Santa Paula over Santa Clara River. A fine example of county, state, and federal cooperation under the Federal Aid Secondary Highway Program.

New Willard Bridge

Continued from page 43 . . .

Reconstructed Span Inadequate

Over its years of service, Willard Bridge became inadequate. The clear width of deck was a little over seventeen feet; deterioration, especially in the timber floor system, reduced the load-carrying capacity. Increasing sizes and weights of trucks, increasing numbers of which sought to use the bridge in service in the expanded oil fields south of the river, necessitated imposition of load weight limits. Collisions sometimes occurred between vehicles on the deck or between vehicles and truss members, endangering traffic, the bridge itself as a river crossing, and use of connecting roads. Bridge maintenance expenses increased at a rate which indicated necessity for replacement of the structure. The highway net to the south and east of the bridge was improved and extended, affording an alternate route to State Highway 79 (Sign Route 126), which passes along the north side of the Santa Clara Valley, also a connection to Route 155, which crosses the mountains to the south. Lack of any nearby alternate crossing of the Santa Clara River, and the expanding oil fields, with other conditions mentioned, gave rise to a demand for reconstruction to modern standards.

Ventura County, through its road department and board of supervisors,

. . . Continued on page 55

New Santa Clara River Bridge at Santa Paula affords adequate roadway for largest vehicles plus sidewalks for pedestrians. Replacement of old Willard Bridge was accomplished by Ventura County under a State Department of Public Works contract financed with county, state, and Federal Aid Secondary Highway Funds.



Beckwourth Pass

Continued from page 21 . . .

Mr. Turner, proprietor of the American Ranch, who entered enthusiastically into my news; it was a thing, he said, he had never dreamed of before. If I could but carry out my plan, and divert travel into that road, he thought I should be a made man for life. Thereupon he drew up a subscription list, setting forth the merits of the project, showing how the road could be made practicable to Bidwell's Bar (about seven miles from Oroville), and thence to Marysville, which latter place would derive peculiar advantages from the discovery. He headed the subscription list with $200.

Bidwell's Bar Excited

"When I reached Bidwell's Bar and unfolded my project, the town was seized with a perfect mania for the opening of the route. The subscription toward the fund amounted to $500. I then proceeded to Marysville, a place which would unquestionably derive greater benefit from the newly discovered route than any other place on the way, since it must be the entrepot or principal starting point for immigrants. I communicated with several of the most influential residents on the subject in hand. They also spoke very encouragingly of my undertaking and referred me, before all others, to the mayor of the city. Accordingly, I waited on that gentleman, Mr. Miles. The mayor entered warmly into my views. As the benefits accruing to the city would be incalculable, he would insure my expenses while I was engaged upon it.

Leads First Train

"I, therefore, left the whole proceeding in his hands, and immediately setting men upon the road, went out to the Trucky (Truckee) to turn immigration into my newly discovered route. I soon led the first train, consisting of 17 wagons through 'Beckwourth Pass.' A northern route had been discovered, and the city had received an impetus that would advance her beyond all her sisters on the Pacific shore. I felt proud of my achievement, and was foolish enough to promise myself a substantial recognition of my labors.

"I was destined to disappointment, for that same night Marysville was laid in ashes. The mayor of the ruined town congratulated me on bringing the train through. He expressed delight at my good fortune, but regretted that their recent calamity had placed it entirely beyond his power to obtain for me any substantial reward. Sixteen hundred dollars I expended upon the road is gone forever, but those who derive advantage from this outlay and loss of time devote no thought to the discoverer."

So we leave poor old Jim among the ashes of Marysville and the ashes of his hopes.



Looking east toward Hallelujah Junction. Western Pacific Railroad overpass in foreground.

New Willard Bridge

Continued from page 54 . . .

applied for federal aid secondary funds, and the Bridge Department of the Division of Highways at the county's request performed a preliminary survey and designed a new bridge. The county designed approaching roadways and acquired new right of way, affording realignment and elimination of a sharp curve with a bad accident record near the south end. The new designs raised the grades of the bridge deck and the north approach, allowing construction of a deck plate girder structure without reducing waterway area. A deck width of 26 feet was provided in the design, plus two four-foot sidewalks and galvanized tubular steel railing.

Pile Driving Problems

Substructure of the new bridge consists of reinforced concrete piers and footings on reinforced concrete piles. This was one of the earlier jobs to employ the new "Spunpiles" manufactured by the Pacific Union Metal Co. Severe pile-driving conditions prevailed, and a special jet was improvised from oil well drill steel. The steel was driven by the pile hammer during jet pumping; on some piles, jetting required over an hour, following which a pile might be driven in fifteen minutes. There were also instances where pile driving was difficult despite the jetting; the piles then sustained exceptionally severe driving stresses, for great efforts were exerted

to drive all piles to at least the planned penetrations.

The deck of the new bridge is carried by two lines of riveted steel plate girders, five feet deep, spaced 20 feet center-to-center. There are 12 spans: the abutment spans are 67 feet long and interior spans 80 feet. The girder support system is one of overhanging spans alternating with suspended spans simply supported on hinges by the overhangs.

Besides highway traffic, Willard Bridge carries many utility conduits including local gas, water, telephone services, crude oil and natural gas long range transmission lines. These all had to be transferred to the new structure by their owners during construction operations of the bridge contractor. Heavy rock riprap protection of the riverbanks was incorporated into the bridge contract.

Cost of Span

The total cost of the contract work exclusive of engineering was $435,-887.13, the bridge itself costing $371,-675.67. To finance the project Ventura County drew on federal aid secondary funds totaling $269,550 plus state matching funds from the County Highway Aid Act of 1945 in the amount of $68,120.65. The balance of the matching funds was furnished by the county. The contract was administered by the Bridge Department of the Division of Highways, of which F. W. Panhorst, Assistant State Highway Engineer, is Chief. W. B. Piper served as Resident Engineer during construction of the foundations and piers, the writer on the superstructure and the major portion of the approach work. Survey parties and most of the assistant resident engineers came from the Ventura County surveyor's office. Robert L. Ryan is county surveyor. Walter K. Loban was assigned to the job for the entire construction period.

O. B. Pierson of Bellflower was general contractor, represented on the job by L. P. Cortner, superintendent. Several subcontractors were employed, notably the Union Steel Company of Los Angeles, in whose shops the girders were fabricated and whose forces erected and riveted the steel on the job.

1953 Highway Dodgettes Girls' Softball



Here are members of 1953 Highway Dodgettes girls' softball team. TOP ROW—Ann Pratt, manager; Velara Meredith, pitcher; Dick Stedmen, assistant manager; Carmen Nardgreen, catcher. MIDDLE ROW—Merry Lou Johnson, shortstop; Geargia Ann Stedmen, right field; Wilma Butz, center field; Virginia Emick, third base; Bertha Fuller, catcher. FRONT ROW—Ann Puccinelli, second base; Margaret Peugh, first base; Hazel Blair, left field; Marjarie Boland, shartstop. Sarah Durrill, right field, and Camille Brawn, second base, are nat in photo.

Bayshore Freeway

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freeway between Seventh Street and the San Francisco - Oakland Bay Bridge.

This project, which covers construction of a viaduct and ramps between Eighth Street and Fourth Street, will be the next to last step in closing the gap between the Bayshore and the bridge. The job will be financed by a $4,500,000 allocation added to the State Highway Budget for the 1953-54 Fiscal Year when the budget was revised in July by the California Highway Commission following enactment of legislation increasing highway user taxes.

Final Construction

One more contract, covering the Fourth to Third Street section and the connecting structures with the Bay Bridge and the proposed Embarcadero Freeway, will complete the connection.

The final construction to be done on the Bayshore Freeway in San Francisco will consist of a one-mile section from Third Street to the south city limits, which will connect with a fill, a portion of which is presently under construction, extending from Candlestick Point across open water of the bay, to a junction with completed freeway in South San Francisco.

The San Francisco Chamber of Commerce held opening ceremonies for the Army-Bryant Street section on October 1st.

First portion of the Bayshore within the City of San Francisco was officially opened to traffic on June 1, 1951. This was the unit extending from Alemany Boulevard to Army Street.

HIGHWAY BIDS AND AWARDS

May, 1953—(Continued)

SAN LUIS OBISPO COUNTY—Between Paso Robles and San Miguel, about 6.4 miles in length, to be graded and imported subbase material placed thereon, and a bridge to be constructed across San Marcos Creek. District V, Route 2, Sections Ps Rs, A. M. J. B. Construction Co., Stockton, $639,932.20; Fredericksen & Kasler, Sacramento, $656,411.60; Mittry Constructors, Los Angeles, $688,736; J. A. Thompson & Son, Inglewood, $697,442.25; Basich Bros. Construction Co., N. L. Basich & R. L. Basich, South San Gabriel, $699,220.35; Fredrickson & Watson Construction Co., Oakland, $713,792.21; Guy F. Atkinson Co., South San Francisco, $732,012.10; Dan Caputo & Edward Keeble, San Jose, $734,226.50; McCammon and Wonderlich Co., Palo Alto, $734,574.75; Flickinger & Welker, Inc., Los Angeles, $738,251; Kirst Construction Co., & Silva & Hill Construction Co., Altadena, $745,965.60; Fredrickson Bros., Emeryville, $760,847.60; Parish Bros., Benicia, $761,454.25; L. A. & R. S. Crow, El Monte, $764,071.10; Piombo Construction Co., San Francisco, $772,007.45; Dimmitt & Taylor, Monrovia, $772,066.50; E. T. Haas Co., Belmont, $772,985.50; Charles MacClosky Co., San Francisco, $783,743; Granite Construction Co., Watsonville, $819,554; Rexroth & Rexroth, Bakersfield, $893,923.05. Contract awarded to Madonna Construction Co., San Luis Obispo, $633,897.50.

SAN MATEO COUNTY—Across San Francisco Bay, between San Mateo and Hayward, a portion of a bridge to be repaired. District IV, Route 105, Section B. Ben C. Gerwick Inc., San Francisco, $106,480; Cement Gun Construction Co., Sausalito, $110,410; Emsco of San Francisco, $142,183.95; Chas. L. Harney Inc., San Francisco, $198,235. Contract awarded to Johnson Western Constructors, Oakland, $99,685.75.

SHASTA COUNTY—Between Lamoine and Castle Crags Park (portions), a net length of about 1.1 miles of existing roadway to be widened at 5 locations and the portions surfaced with plant-mixed surfacing on untreated rock base. District II, Route 3, Section D. Contract awarded to Morgan Construction Co., Redding, $33,506.50.

SHASTA COUNTY—At Churn Creek, Dry Creek, and Salt Creek between 3 and 12 miles northeast of Redding, existing bridges to be repaired and road approaches to be constructed. District II, Route 28, Section A. R. E. Hertel, Sacramento, $43,870; Anson-Smith Construction Co., Marysville, $49,800; Minton Co., Oakland, $53,686.50; Bos Construction Co., Berkeley, $55,888.60; B. S. McElderry, Berkeley, $59,580; Fredrickson & Watson Construction Co., Oakland, $60,946; Charles MacClosky Co., San Francisco, $63,535; Friant Construction Co., Fresno, $64,953; O'Connor Bros., Red Bluff, $65,227.50. Contract awarded to R. G. Clifford & C. O. Bodenhamer, Berkeley, $42,438.

TRINITY COUNTY—Between 4.0 miles south of Weaverville and Douglas City, about 2.3 miles in length to be graded and surfaced with plant-mixed surfacing on cement treated base and a reinforced concrete bridge to be constructed. District II, Route 20, Section A. Harms Bros., Sacramento, $417,710.80; Transocean Engineering Corporation, Hayward, $450,000; Gordon Ball & San Ramon Valley Land Co., & Bell & Simpson, Berkeley, $479,980. Contract awarded to M. W. Brown & R. E. Hertel, Redding, $391,628.90.

VENTURA AND SANTA BARBARA COUNTIES—Between 9.6 miles southeasterly and 7.1 miles northwesterly of Ventura-Santa Barbara county line, five reinforced concrete slab bridges to be constructed and about 0.5 mile of approaches to be graded and surfaced with road mixed surfacing. District VII, Route 138, Sections E, A. W. F. Maxwell, Los Angeles, $148,462.50; E. G. Perham, Los Angeles, $157,259.50; E. S. & N. S. Johnson, Fullerton, $158,357; Norman I. Fadel, North Hollywood, $164,351.20; Chas. MacClosky Co., San Francisco, $165,145.50; Chaney Construction Co., Los Angeles, $169,622; O. B. Pierson, Bellflower, $171,174.50; Tumblin Co., Bakersfield, $181,159; Byerts & Sons & George K. Thatcher, Los Angeles, $226,980.45. Contract awarded to Thomas Construction Co., Fresno, $141,037.10.

F. A. S. County Roads

LOS ANGELES COUNTY—On Valley Boulevard, between Puente Avenue and Hudson Avenue, about 2.1 miles in length to be widened and surfaced with plant-mixed surfacing on Portland cement concrete base and existing pavement. District VIII, Route 852. Warren Southwest, Inc., Torrance, $140,777.05; Basich Bros., Construction Co., & N. L. Basich and R. L. Basich, South San Gabriel, $149,770.75; Service Construction Co. of Southern California, Sun Valley, $151,829.60; Griffith Co., Los Angeles, $152,150.25; Vido Kovacevich Co., Rosemead, $153,037.70; McAmis & Baker, Gardena, $154,982.30; Osborn Co., Pasadena, $165,795.80; George Herz & Co., San Bernardino, $170,460.40; Dimmitt & Taylor, Monrovia, $194,475.65. Contract awarded to J. E. Haddock, Ltd., Pasadena, $138,809.

MONTEREY COUNTY—On Alisal-Old Stage Road, between Bardin School and 1.6 miles south of Iverson Road, about 12.2 miles in length, a class "B" double seal coat to be placed on imported base material, District V, Route 657. Browne & Krull, Hayward, $190,305.80; Hermrack & Easter, Santa Maria, $193,539; Granite Construction Co., Watsonville, $199,808.13; Close Building Supply, Inc., Hayward, $203,417; Edward Keeble, San Jose, $219,859; Valley Paving Co., Pismo Beach, $238,900.50. Contract awarded to Baun Construction Co., Fresno, $162,423.

PLUMAS COUNTY—Across Middle Fork Feather River and over the Western Pacific Railroad tracks, in the city of Portola, 2 steel girder bridges and approaches to be constructed. District II, Route 1061. Tumblin Co., Bakersfield, $256,526; Chaney Construction Co., Los Angeles, $263,839.90; John C. Gist Co., Sacramento, $273,131; Trewhitt Shields & Fisher, Fresno, $273,498.39; C. B. Tuttle, Long Beach, $279,425; Fredrickson Bros.-Le Boeuf-Dougherty Construction Co.-Erickson and Pierson, Emeryville, $304,752.55; Charles MacClosky Co., San Francisco, $327,620.20. Contract awarded to Walsh Construction Co., San Francisco, $235,806.

SHASTA COUNTY—Between 0.3 mile west of Cow Creek and 0.7 mile west of Whitmore, about 4.0 miles in length, to be graded, imported base material to be placed, seal coat to be applied and a reinforced concrete bridge across Cow Creek to be constructed. District II, Route 1075. M. W. Brown, Redding, $240,898.80; Fredrickson & Watson Construction Co., Oakland, $244,076.28; Close Building Supply Inc., Hayward, $252,752.20; Harms Bros.. Sacramento, $257,236.50; J. H. Trisdale Inc., Redding, $280,563.11. Contract awarded to Transocean Engineering Corporation, Hayward, $207,675.

June, 1953

ALAMEDA COUNTY—Between Crow Canyon Road and 0.1 mile east of Foothill Boulevard about 2.2 miles in length, to be graded and paved with portland cement concrete on cement-treated subgrade and four reinforced concrete bridges and a pedestrian undercrossing to be constructed. District IV, Route 5, Section G. Fredrickson & Watson Construction Co. and M & K Corporation, Oakland, $1,195,555.75; Gordon H. Ball and San Ramon Valley Land Co., Berkeley, $1,230,660.90; Cbarles MacClosky Co. and Piombo Construction Co., San Francisco, $1,291,806.65; Dan Caputo & Edward Keeble, San Jose, $1,347,312.25; Chas. L. Harney Inc., San Francisco, $1,376,372.95. Contract awarded to Fredrickson Bros., Emeryville, $1,176,448.35.

ALAMEDA COUNTY—Between 0.4 mile westerly of Hesperian Boulevard and 0.3 mile northerly of Harder Road, about 1.4 miles in length to be graded, plant-mixed surfacing to be placed on cement-treated base and crusher-run base and a traffic signal system and highway lighting to be furnished and installed. District IV, Route 105, Section A. Fredrickson Bros., Emeryville, $244,794.35; Lee J. Immel, San Pablo, $246,176.50; Gordon Ball and San Ramon Valley Land Co., Berkeley, $290,008.50. Contract awarded to Fredrickson and Watson Construction Co., and M & K Corporation, Oakland, $239,922.60.

ALAMEDA AND CONTRA COSTA COUNTIES—In the Broadway Low Level Tunnel in and near Oakland, additional fire protection facilities to be furnished and installed. District IV, Route 75, Sections Oak, A. C. Norman Peterson, Berkeley, $28,940. Contract awarded to Associated Engineers, Inc., Palo Alto, $28,813.

AMADOR, CALAVERAS, MERCED AND SAN JOAQUIN COUNTIES—At various locations, about 32.3 miles in net length, Class "C—Fine" seal-coat to be applied to existing surfacing. District X, Route-Var. Granite Construction Co., Watsonville, $38,706; Claude C. Wood Co., Lodi, $41,314.11; J. Henry Harris, Berkeley, $45,054.45; Floyd O. Bailey, Madera, $46,948. Contract awarded to J. P. Breen Co., Sacramento, $37,829.40.

CONTRA COSTA COUNTY—At the intersections of San Pablo Avenue with Central Avenue in the City of El Cerrito, and Parker Avenue with Fourth Street in the Town of Rodeo, traffic signal systems and highway lighting to be furnished and installed. District IV, Route 14, Sections ECr, B. L. H. Leonardi Electric Construction Co., San Rafael, $14,880; R. Goold & Son, Stockton, $15,196; Abbett Electric Corp., San Francisco, $19,915; Sacramento Electric Works, Sacramento, $20,822.80. Contract awarded to Howard Electric Co., Gilroy, $14,329.

DEL NORTE COUNTY—Between 0.5 mile and 2.3 miles east of Klamath, about 1.8 miles to be graded and surfaced with road-mixed surfacing on imported base material. District I, Route 46, Section A. Paul E. McCollum, Richmond, $198,495; Harms Bros., Sacramento, $222,794. Contract awarded to Humboldt Constructors, Inc., Eureka, $179,985.50.

DEL NORTE COUNTY—Across Gilbert Creek about 1 mile south of California-Oregon State Line, a reinforced concrete girder bridge to be constructed. District I, Route 71, Section B. Anson-Smith Construction Co., Marysville, $81,388; James B. Allen, San Carlos, $85,264; Mercer Fraser Co., and Mercer Fraser Gas Co., Inc., Eureka, $86,468; R. G. Clifford and C. O. Bodenbamer, Berkeley, $87,748; F. Fredenburg, Temple City, $87,937; Humboldt Constructors, Inc., Eureka, $89,034; Bos Construction Co., Berkeley, $97,605.50; D. W. Scott and Osborne-Wheelon Construction Co., Crescent City, $127,381.90. Contract awarded to G. M. Carr Co. and Batti Rocca, Santa Rosa, $70,133.

FRESNO COUNTY—In the City of Fresno, between Cherry Avenue and Santa Clara Street, 0.7 mile to be graded and paved with portland cement concrete pavement on cement-treated subgrade. District VI, Route 4. M. J. B. Construction Co., Stockton, $189,635; Gordon Ball and San Ramon Valley Land Co., Berkeley, $191,480; Gene Richards, Inc., Fresno, $172,946.90. Contract awarded to Thomas Construction Co., Fresno, $168,996.

HUMBOLDT COUNTY—Between Stephens Grove and Weott (portions) about 9.9 miles in net length to be surfaced with plant-mixed surfacing on imported base. District I, Route 1, Section C. Gordon Ball and San Ramon Valley Land Co., Berkeley, $155,592; Mercer, Fraser Co. and Mercer, Fraser Gas Co., Inc., Eureka, $175,065. Contract awarded to Fredrickson Bros., Emeryville, $152,732.50.

HUMBOLDT COUNTY—In the Town of Scotia at north Scotia transition highway lighting system to be furnished and installed. District I, Route 1, Section E. L. H. Leonardi Electric Construction Co., San Rafael, $6,792; Underground Electric Construction Co., Oakland, $7,272; Roy P. Hayes, Sacramento, $7,598; Karl F. Stolting, Santa Rosa, $7,812; Roy E. Caffey, Sacramento, $8,419.70; Brizard Construction Co., Eureka, $9,893. Contract awarded to Flash Electric, Eureka, $5,849.

HUMBOLDT COUNTY—Across Bluff Creek, about 10.5 miles southwest of Orleans, an existing timber trestle and steel truss bridge to be reconstructed. District 1, Route 46, Section D. Stanley H. Koller, Construction, Crockett, $15,512.50; D. M. Sandling, San Pablo, $19,282.13. Contract awarded to James H. McFarland, San Francisco, $10,975.

HUMBOLDT COUNTY—Between Gannon Slough and 0.9 mile north of Plaza Avenue, about 2.9 miles in length, imported sub-base material, cement-treated base and plant-mixed surfacing to be constructed. District I, Route 1, Section H, Arc, 1. Gordon Ball & San Ramon Valley Land Co., Berkeley, $564,084.50; Munn & Perkins and Paul E. McCollum, Modesto, $578,160. Contract awarded to Mercer, Fraser Co. and Mercer, Fraser Gas Co., Inc., Eureka, $539,393.80.

KERN COUNTY—Between Sand Cut near Sivert and Cable, about 7.8 miles in length to be surfaced with plant-mixed surfacing over cement-treated base. District VI, Route 58, Sections D,E. Dicco Inc., Bakersfield, $200,936.25; R. R. Hensler, Sun Valley, $206,211.25; Valley Paving Co., Pismo Beach, $231,-853.75. Contract awarded to Griffith Co., Los Angeles, $183,864.

KERN COUNTY—Between Snow Road and Cawelo, about 7.4 miles in length, cross-overs, road connections, and frontage roads to be graded, untreated rock base and plant-mixed surfacing to be placed, and a right of way fence to be constructed. District VI, Route 4, Sections D,E. Dicco Inc., Bakersfield, $169,-789.70; Valley Paving Co., Pismo Beach, $153,-920.50; Griffith Co., Los Angeles, $154,793. Contract awarded to Hermreck and Easter Contractors, Santa Maria, $148,576.

LOS ANGELES COUNTY — Between Flower Street northbound on ramp and Olympic Boulevard in the City of Los Angeles about 1.1 miles in length to be graded and paved with portland cement concrete pavement on cement-treated subgrade and with asphalt concrete on untreated rock base and 10 retaining walls and 3 bridges to be constructed. District VII, Route 165. J. E. Haddock, Ltd., Pasadena, $1,712,775.75; Griffith Co., Los Angeles, $1,747,-907.75; Webb & White, Los Angeles, $1,811,424.15; Charles MacClosky Co., Clyde W. Wood & Sons, Inc., and C. G. Willis and Sons, Inc., J. V., San Francisco, $1,863,102.15; Guy F. Atkinson Co., Long Beach, $1,895,000. Contract awarded to Oberg Bros., Construction Co., Inglewood, $1,655,337.25.

LOS ANGELES COUNTY—On freeway between Leonis Street and Dunham Street, over the tracks of the Union Pacific Railroad, a structural steel and reinforced concrete overhead to be constructed and approaches thereto to be graded. District VII, Route 167, Section B. Peter Kiewit Sons' Co., Arcadia, $1,143,634.50; O. B. Pierson and Fontana Steel, Paramount, $1,146,551; B. J. Ukropina, T. P. Polich, Steve Kral, John R. Ukropina, San Gabriel, $1,157,-932.50; Griffith Co., Los Angeles, $1,159,351; Webb & White, Los Angeles, $1,172,095; Charles MacClosky Co., San Francisco, $1,181,284; W. F. Maxwell, Los Angeles, $1,185,744; J. E. Haddock, Ltd., Pasadena, $1,191,826; R. M. Price Co., Altadena, $1,201,815; Oberg Bros. Construction Co., Inglewood, $1,204,556; Byerts & Sons, and Geo. K. Thatcher, Los Angeles, $1,213,570; Fredericksen & Kasler, Sacramento, $1,213,769.90; Tumblin Co., Bakersfield, $1,225,370; Guy F. Atkinson Co., Long Beach, $1,228,639; Bongiovanni Construction Co., Hollywood, $1,360,000. Contract awarded to J. A. Thompson & Son, Inglewood, $1,140,221.50.

LOS ANGELES COUNTY—At the intersection of Lakewood Boulevard with South Street, intersection to be graded and paved with asphalt concrete surfacing on untreated rock base. District VII, Route 168, Section A. Vido Kovacevich Co., Rosemead, $13,646; C. O. Sparks, Inc., and Nundo Engineering Co., Los Angeles, $15,335.30; Jesse S. Smith, Glendale, $15,705; Warren Southwest Inc., Torrance, $17,115.70. Contract awarded to Griffith Co., Los Angeles, $12,597.20.

LOS ANGELES AND ORANGE COUNTIES—Across San Gabriel River about 2 miles easterly of Long Beach, extend the existing reinforced concrete bridge and reconstruct approaches thereto. District VII, Route 179, Sections A,A. W. F. Maxwell, Los Angeles, $96,788; E. G. Perham, Los Angeles, $100,-652; O. B. Pierson, Bellflower, $103,707.50; Vido Kovacevich Co., Rosemead, $112,148.50; Norman I. Fadel, North Hollywood, $112,156; Charles MacClosky Co., San Francisco, $113,955; Cox Bros. Construction Co., Stanton, $114,740.30; Byerts & Sons and Geo. K. Thatcher, Los Angeles, $117,857.50. Contract awarded to Owl Truck & Construction Co., Compton, $96,590.

MADERA COUNTY—Between Merced County line and Califa (portions); a net length of about eight and two-tenths (8.2) miles to be widened with imported subbase material and surfaced with plant-mixed surfacing on untreated rock base. District VI, Route 32, Section A. Valley Paving Co., Pismo Beach, $274,705; Stewart & Nuss, Inc., Fresno, $275,-966.50; Fredrickson & Watson Construction Co., Oakland, $276,587.70; Granite Construction Co., Watsonville, $300,757; Gene Richards, Inc., Fresno, $314,000. Contract awarded to Volpa Bros., Fresno, $251,553.

MARIN COUNTY—On Mt. Tamalpais State Park Highway between Pan Toll Junction and West Peak, about 2.7 miles in length, to be graded, selected material to be placed and bituminous surface treatment to be applied. District IV, Route-Tamalpais Park Highway. Ghilotti Bros., Inc., San Rafael, $85,995; Eaton and Smith, San Francisco, $89,888; J. Henry Harris, Berkeley, $90,036.05. Contract awarded to Brown-Ely Co., Contractors, Corte Madera, $77,-148.75.

MARIPOSA COUNTY—For cleaning and painting five bridges, in Mariposa County, across Mariposa Creek, Bear Creek, Merced River, Maxwell Creek, and Black Creek, between Mariposa and 1.2 miles west of Coulterville. District X, Routes 18, 65, 110, Sections J; C, B, A; B. J. S. Morris Co., Berkeley, $8,472; R. W. Reade & Co., $8,810; Deemer & Deemer, San Francisco, $9,250; Orrell-Keefe Co., Oakland, $9,830; H. C. McKern, San Jose, $11,590. Contract awarded to John P. McGuire, San Jose, $7,869.

MARIN COUNTY—Between 2 miles east of Alto Intersection and 0.1 mile west of Belvedere, about 1.3 miles in length, to be graded and imported subbase material, untreated rock base, and plant-mixed surfacing to be placed. District IV, Route 52, Section A. E. A. Forde Co., San Anselmo, $103,546.05; A. G. Raisch Co., San Rafael, $107,345.50. Contract awarded to Brown-Ely Co., Contractors, Corte Madera, $90,549.50.

MENDOCINO COUNTY—Between 4.1 miles north of Forsythe Creek and Ridgewood Summit about 4.9 miles to be graded and drainage facilities to be constructed. District I, Route 1, Sections D, E. Guy F. Atkinson Co., South San Francisco, $996,-870.70; Arthur B. Siri, Inc., Santa Rosa, $1,067,-224.96; McNutt Brothers, Eugene, Oregon, $1,067,-654; Fredrickson & Watson Construction Co., & M & K Corporation, Oakland, $1,120,643.70; Harms Bros., Sacramento, $1,134,927.10; Gordon H. Ball & San Ramon Valley Land Co., Berkeley, $1,175,-265.20. Contract awarded to McCammon-Wonderlich Co., Palo Alto, $985,452.99.

MENDOCINO COUNTY—Between 0.6 mile south of Outlet Creek and Reeves Creek, about 6 miles north of Willits, about 4.8 miles in length to be surfaced with plant-mixed surfacing on cement-treated base. District I. Route 1, Section F. Harms Bros., Sacramento, $183,494; Clements Construction Co., Hayward, $185,158. Contract awarded to Antioch Paving Co., Inc., Antioch, $181,089.35.

MENDOCINO COUNTY—At Manchester Maintenance Station, truck shelter, gas and oil house, pump house, grease rack and loading platform, sewer system and chain link fence to be constructed. District I, Route 56, Section B. Contract awarded to Baldwin Contracting Co., Inc., San Rafael, $34,945.

MONTEREY COUNTY—About 3 miles south of Soledad, highway curve to be reconstructed. District V, Route 2, Section D. Edward Keeble, San Jose, $7,405; Valley Paving Co., Pismo Beach, $8,705; Granite Construction Co., Watsonville, $9,743. Contract awarded to Baun Construction Co., Fresno, $7,245.

MONTEREY COUNTY—City of Salinas, at and adjacent to the intersection of U. S. 101 with Laurel Drive and with Curtis Street, traffic signal systems to be furnished and installed and channelization to be constructed. District V, Route 2. Edward Keeble, San Jose, $56,850; Louis Electric Co., Salinas, $57,-569.41. Contract awarded to Howard Electric Co., Gilroy, $53,862.

ORANGE COUNTY—On Imperial Highway between La Mirada Avenue and Fullerton Road, about 2.0 miles in length to be graded and paved with asphalt concrete on untreated rock base. District VII, Route 176, Sections A, LHbr. Warren Southwest, Inc., Torrance, $169,642.50; Cox Bros. Construction Co., Stanton, $170,498.70; Baker and Pollock, Ventura, $171,093.60; Sully-Miller Contracting Co., Long Beach, $171,627.88; R. J. Noble Co., Corporation, and R. J. Noble, Orange, $172,407; Dimmitt & Taylor, Monrovia, $174,060.80; Roland T. Reynolds & Arthur H. Famularo, Anahcim, $177,694.50; Webb & White, Los Angeles, $180,823; Matich Bros., Colton, $189,716; M. S. Mecham & Sons, South Gate, $192,331. Contract awarded to Griffith Co., Los Angeles, $168,647.

PLACER COUNTY—Between 1.0 mile south of Roseville and 0.5 mile east of Roseville, 3.5 miles in length of roadbed for a four-lane divided highway to be graded and six bridges to be constructed. District III, Routes 3, 17, Sections A, Rsv, A. Gordon Ball & San Ramon Valley Land Co. & Harms Bros., Sacramento, $1,283,193.30; McCammon-Wunderlich Co., Palo Alto, $1,284,333.80; Fredericksen & Kasler, Sacramento, $1,349,277.45; Guy F. Atkinson Co., South San Francisco, $1,366,171.25; Charles MacClosky Co., San Francisco, $1,374,729.80; A. Teichert & Son, Inc., Sacramento, $1,556,647.50. Contract awarded to Ukropina, Polich, Kral, San Gabriel, $1,277,501.30.

PLUMAS COUNTY—At Graeagle Creek, about 1.6 miles south of Blairsden, a bridge to be constructed and about 0.1 mile in length of bridge approaches to be graded and a detour to be constructed. District II, Route 83, Section A. Walsh Construction Co., San Francisco, $60,531; R. G. Clifford and C. O. Bodenhamer, Berkeley, $60,712; Ruby Construction Co., Inc., Sacramento, $65,100.25; James B. Allen, San Carlos, $66,957; Friant Construction Co., Fresno, $68,339.40; Bos Construction Co., Berkeley, $76,259.50; James H. McFarland, San Francisco, $76,551; Stanley H. Koller Construction, Crockett, $85,984. Contract awarded to Minton Co., Contractors, Oakland, $59,463.

RIVERSIDE COUNTY—Between 1.2 miles east of Whitewater and 2.3 miles west of Garnet, about 2.3 miles in length to be graded and surfaced with plant-mixed surfacing on cement-treated base. District VIII, Route 26, Section D. Matich Bros., Colton, $354,472; E. L. Yeager Co., Riverside, $356,992; Granite Construction Co., Watsonville, $361,002; Fredericksen & Kasler, Sacramento, $422,815. Contract awarded to Basich Bros. Construction Co., R. L. Basich & N. L. Basich, South San Gabriel, $346,749.

RIVERSIDE COUNTY—Between 0.1 mile west of Arabia Street and 0.1 mile east of California Street in the City of Indio, about 0.9 mile in length, to be widened with cement-treated base and road-mixed surfacing; and seal coats to be applied to entire roadbed. District XI, Route 64. E. L. Yeager Co., Riverside, $51,208; Rankin & Booth, Playa Del Rey, $51-416.75; E. S. & N. S. Johnson, Fullerton, $52,375.75; James E. Roberts, San Bernardino, $54,199; Flickinger-Welker, Inc., Los Angeles, $58,046; Marks Bros. Construction Co., El Centro, $58,086.50. Contract awarded to Matich Brothers, Colton, $49,-587.50.

RIVERSIDE COUNTY—At the intersection of Route 78 with Alessandro Boulevard; District VIII, Route 78, Section D. Contract awarded to Fischbach and Moore, Inc., Los Angeles, $2,804.

RIVERSIDE COUNTY—Portions between Desert Center and the Colorado River, about 22.3 miles in net length, plant-mixed surfacing to be placed over portions of existing roadbed; and seal coat to be applied to portions of existing surfacing. District XI, Route 64, Sections C, D, E, Bly, F. Granite Construction Co., Watsonville, $118,396.75; R. R. Hensler, Sun Valley, $123,287.50; G. W. Ellis Construction Co., North Hollywood, $129,039; Valley Paving Co., Pismo Beach, $139,300. Contract awarded to John J. Swiggart Co., Orange, $113,287.50.

SAN BERNARDINO COUNTY—In the City of San Bernardino on Mt. Vernon Avenue between Fourth and Seventh Streets, drainage facilities to be constructed and installed. District VIII, Route 31. George Herz & Co., San Bernardino, $52,150.10; James E. Roberts, San Bernardino, $58,362; Hubbs Equipment Co., Colton, $60,882.50; Norman I. Fadel, North Hollywood, $61,690; Matich Bros.,

Colton, $67,505.20; E. C. Young, San Fernando, $68,925. Contract awarded to Lloyd R. Johnson, Rialto, $46,259.50.

SAN BERNARDINO COUNTY—In the City of Colton on I Street between west city limits and east city limits, about 1.5 miles to be surfaced wih plant-mixed surfacing. District VIII, Route 26. Matich Bros., Colton, $40,154.75; Vernon Paving Co., Los Angeles, $41,495. Contract awarded to R. A. Erwin, Colton, $37,438.

SANTA CLARA COUNTY—Between Route 2 (El Camino Real) and Route 68 (Bayshore Highway), about 2.5 miles in net length, to be widened by grading and placing plant-mixed surfacing on existing pavement and cement-treated base and an existing bridge to be widened by constructing a reinforced concrete bridge extension surfaced with plant-mixed surfacing and cement-treated base. District IV, Route 113, Section A. McCammon-Wunderlich Co., Palo Alto, $161,393.58; Leo F. Piazza Paving Co., San Jose, $162,644; L. C. Smith Co., San Mateo, $163,813.30; S. A. E. Co., Redwood City, $169,843.30; A. J. Raisch Paving Co., San Jose, $178,562. Contract awarded to Granite Construction Co., Watsonville, $160,414.

SANTA CLARA COUNTY—At Bolsa Road intersection and Carnadero Creek Bridge, channelization, highway lighting, bin-type retaining walls and bridge railing to be constructed. District IV, Route 2, Section C. Edward Keeble, San Jose, $37,685; Granite Construction Co., Watsonville, $38,854.10; James B. Allen, San Carlos, $38,939; Joe W. Douglass, San Jose, $49,449. Contract awarded to Wm. Radtke & Son, Gilroy, $35,417.25.

SANTA CRUZ COUNTY—Between one mile southeast and 0.6 mile northwest of Laguna Creek, about 1.6 miles in length, to be graded and surfaced with plant-mixed surfacing on untreated rock base and construct a 13 foot by 13 foot reinforced concrete culvert. District IV, Route 56, Section B. Granite Construction Co., Watsonville, $345,630.95; Gordon Ball and San Ramon Valley Land Co., Berkeley, $387,354.80; Fredericksen & Kasler, Sacramento, $424,900.20; McCammon-Wunderlich Co., Palo Alto, $470,235.15. Contract awarded to Edward Keeble, San Jose, $316,057.30.

SAN DIEGO COUNTY—Between 0.3 mile north of Escondido and 3.4 miles south of Riverside County line, about 19.5 miles in net length, seal coats to be applied. District XI, Route 77, Sections F, G. E. S. & N. S. Johnson, Fullerton, $33,915; G. J. Payne Co., Inc., Los Angeles, $34,258.50; Cox Bros. Construction Co., Stanton, $35,907.90; George Herz & Co., San Bernardino, $37,464. Contract awarded to Einer Bros., Inc., Escondido, $30,991.50.

SAN FRANCISCO COUNTY—Wye Viaduct and connecting ramps, Route 2 to Route 68, a portion of a bridge and miscellaneous road work to be constructed. District IV, Routes 2, 68. Erickson, Phillips & Weisberg, Concord, $775,896; Dan Caputo, San Jose, $786,548.25; Peter Kiewit Sons' Co., San Francisco, $792,951; Rothschild, Roffin & Weirick, San Francisco, $814,823.20; Charles MacClosky Co., San Francisco, $816,487.20; Guy F. Atkinson Co., South San Francisco, $824,930.10; Fredrickson & Watson Construction Co., & M & K Corporation, Oakland, $851,555.30; S. J. Amoroso Construction Co., San Francisco, $877,359.95. Contract awarded to Chas. L. Harney, Inc., San Francisco, $769,853.80.

SAN FRANCISCO COUNTY—At San Francisco-Oakland Bay Bridge, a timber fender at Pier W-3 to be repaired. District IV, Route 68. The Duncanson-Harrelson Co., Richmond, $31,700; Smith-Rice Co., San Francisco, $34,648; Healy-Tibbitts Construction Co., San Francisco, $34,730. Contract awarded to Hart & Hynding Inc., San Francisco, $23,886.

SAN FRANCISCO COUNTY—In Yerba Buena Island Tunnel of San Francisco-Oakland Bay Bridge, tile lining to be repaired. District IV, Route 68. Duffy Tile Co., San Francisco, $4,232.50; National Tile & Terrazzo Co., Inc., San Francisco, $4,462.50; Rigney Tile Co., Oakland, $4,575. Contract awarded to Superior Tile Co., Oakland, $4,195.

SAN LUIS OBISPO AND MONTEREY COUNTIES—Across San Simeon Creek and Mud Creek, about 3.8 miles and 33.9 miles north of Cambria, two existing steel bridges to be cleaned and painted. District V, Route 56, Sections B, A. A. O. Miller Waterproofing and Painting Co., Los Angeles, $15,130; Deemer & Deemer, San Francisco, $16,400; Klaas Bros., Los Angeles, $16,562; J. S. Morris Co., Berkeley, $21,060; R. W. Reade and Co., Berkeley, $21,094. Contract awarded to John P. McGuire, San Jose, $14,273.

SAN LUIS OBISPO COUNTY—Morro Bay State Park, about 0.2 mile of 12-foot roadway and parking area to be graded and surfaced with plant-mixed surfacing on untreated rock base. District V. Hermreck & Easter, Contractors, Santa Maria, $6,325; Granite Construction Co., Watsonville, $7,076.60. Contract awarded to Valley Paving Co., Pismo Beach, $5,236.50.

SAN MATEO COUNTY—Between 0.1 mile north of 16th Avenue and 0.2 mile south of Bransten Road, about 5 miles in length, to be graded and surfaced with plant-mixed surfacing on cement-treated base and six bridges to be constructed and one bridge to be widened. District IV, Route 68, Sections S, M, C, Bmt, SCar. L. C. Smith Co., San Mateo, $3,749,629.54; Peter Kiewit Sons' Co., San Francisco, $3,839,392; Fredrickson & Watson Construction Co., & M & K Corporation, Oakland, $3,876,596.71; Chas. L. Harney, Inc., San Francisco, $4,276,900; Macco Corporation & Morrison-Knudsen Co., Inc., Paramount, $4,536,756; Guy F. Atkinson Co., South San Francisco, $4,624,243.60. Contract awarded to Piombo Construction Co., San Francisco, $3,749,132.60.

SAN MATEO COUNTY—Between 0.3 mile and 1.3 miles south of the San Francisco County line, about 1 mile in length to be graded. District IV, Route 68, Section E. Chas. L. Harney Inc., San Francisco, $868,827.70; McCammon-Wunderlich Co., Palo Alto, $889,832.35; Peter Kiewit Sons' Co., San Francisco, $933,666; Eaton & Smith, San Francisco, $1,012,437; Macco Corporation & Morrison-Knudsen Co., Paramount, $1,062,364; Fredrickson & Watson Construction Co., & M & K Corporation, Oakland, $1,068,292.55; Piombo Construction Co. & Parish Bros., San Francisco, $1,099,057.50; Gordon Ball & San Ramon Valley Land Co., Berkeley, $1,154,334; L. C. Smith Co., San Mateo, $1,295,794. Contract awarded to Guy F. Atkinson Co., South San Francisco, $856,704.10.

SONOMA COUNTY—Between 7.5 miles north of Stewarts Point and Gualala, 3.0 miles, portions to be widened with imported borrow and excavated material and surfaced with road-mixed surfacing on untreated rock base, and seal coat to be applied to entire project. District IV, Route 56, Section E. Claude C. Wood Co., Lodi, $85,729.75; Huntington Bros., Napa, $85,900; J. R. Armstrong, El Cerrito, $86,095.01; Harms Bros., Sacramento, $91,699. Contract awarded to Arthur B. Siri, Inc., Santa Rosa, $69,872.85.

SONOMA COUNTY—Between 1.0 mile northwest of Monte Rio and Monte Rio (portions), a net length of 0.5 mile to be graded and surfaced with plant-mixed surfacing on imported base material. District IV, Route 104, Section A. Brown-Ely Co. Contractors, Corte Madera, $78,683.50; Arthur B. Siri, Inc., Santa Rosa, $82,401.80; J. Henry Harris, Berkeley, $93,452.50; Helwig Construction Co., Sebastopol, $94,463. Contract awarded to Eaton & Smith, San Francisco, $76,990.75.

STANISLAUS COUNTY—In Turlock State Park, about 8 miles west of La Grange, parking areas, boat ramps and road to be graded and either surfaced with plant-mixed surfacing or penetration treatment applied. District X. M. J. Ruddy & Son, Modesto, $29,908.50; Donald Graves, San Jose, $31,005; George Reed, Modesto, $31,465; Wm. S. & Bruce F. Rogers Co., Madera, $31,962.50; Munn & Perkings, Modesto, $34,710; John A. Carstensen, Castro Valley, $35,010; J. Henry Harris, Berkeley, $36,627.50. Contract awarded to Standard Materials Inc., Modesto, $28,125.

TULARE COUNTY—In and adjacent to the City of Tulare, between Tulare Airport and Tagus, highway lighting and illuminated sign systems to be furnished and installed. District VI, Route 4, Sections B, Tul, F. Sacramento Electric Works, Sacramento, $46,377.90; A-C Electric Co., Bakersfield, $54,665; R. Goold & Son, Stockton, $55,310; Dale Electric, Fresno, $60,000; Robinson Electric, Fresno, $60,891; A. S. Schulman Electric Co., Los Angeles, $71,966. Contract awarded to Howard Electric Co., Gilroy, $45,515.

VENTURA COUNTY—At Haun Creek, approximately one mile east of the City of Santa Paula, a reinforced concrete bridge to be constructed and the approaches and drainage facilities are to be reconstructed. District VII, Route 79, Section B. W. F. Maxwell, Los Angeles, $59,854.50; Hermreck & Easter, Santa Maria, $59,913.50; Friant Construction Co., Fresno, $61,883.50; O. B. Pierson, Bellflower, $64,875.50; Jesse S. Smith, Glendale, $65,093.75; E. G. Perham, Los Angeles, $65,422; Barringer & Botke, Santa Paula, $65,937.50; Wonderly Construction Co., Long Beach, $66,869.25; E. S. & N. S. Johnson, Fullerton, $70,851. Contract awarded to Norman I. Fadel, North Hollywood, $55,804.50.

F. A. S. County Roads

COLUSA COUNTY—Between 4 miles east of Arbuckle and State Route 88, about six and one-tenth (6.1) miles in length, to be graded and surfaced with imported base material and seal coat applied. District III, Route 1032. W. H. O'Hair Co., Colusa, $99,157.50; Stephens Trucking Co., French Camp, $101,428; Rice Bros., Inc., Marysville, $102,457.50; P. J. Moore & Son, West Sacramento, $103,120; A. Teichert & Son, Inc., Sacramento, $104,865; Harms Bros., Sacramento, $106,695; W. C. Railing, Woodland, $111,509.30; Eugene G. Alves, Pittsburg, $111,885; Clements Construction Co., Hayward, $116,287.75; Claude C. Wood Co., Lodi, $118,710; John M. Ferry, Glendale, $145,999.50. Contract awarded to Browne and Krull, Hayward, $97,872.

LASSEN COUNTY—Between north city limits of Susanville and north side of Willow Creek Valley (portions), about 13.3 miles in net length; to be surfaced with plant-mixed surfacing. District II, Route 988. Clements & Co., Hayward, $146,320; Granite Construction Co., Watsonville, $148,080; Harms Bros., Sacramento, $152,881; Donald Graves, San Jose, $157,733; W. C. Railing, Woodland, $167,784; Floyd O. Bailey & William S. & Bruce F. Rogers Co., Madera, $181,466; A. Teichert & Son, Inc., Sacramento, $189,692; Munn & Perkins, Modesto, $192,500. Contract awarded to Peter Kiewit Sons' Co., San Francisco, $141,348.

MENDOCINO COUNTY—Between 9.9 miles and 5.4 miles easterly of Dos Rios about 4.5 miles in length to be graded and drainage facilities constructed. District I, Route 505. M. Malfitano & Son, Inc., Pittsburg, $164,877; Stanley H. Koller Construction and Paul E. McCollum, Crockett, $173,241; W. H. O'Hair Co., Colusa, $181,986.80; Humboldt Construction, Inc., Eureka, $183,572; Anthur B. Siri, Inc., Santa Rosa, $195,090; Harms Bros., Sacramento, $202,354.80; C. V. Kenworthy, Stockton, $228,647.50; Transocean Engineering Corporation, Hayward, $232,974. Contract awarded to Cecil L. Moore, San Leandro, $133,484.20.

SISKIYOU COUNTY—Between 7.2 miles east of Grenada and State Route 72, a total length of about 10.9 miles of existing roadway to be surfaced with plant-mixed surfacing. District II, Route 1166. A. Teichert & Son, Inc., Sacramento, $146,488; Harms Bros., Sacramento, $147,357.60. Contract awarded to Clements Construction Co., Hayward, $145,245.

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ALAMEDA COUNTY—Between 0.6 mile north of Southern Pacific Railroad Overhead and 0.2 mile south of Western Pacific Railroad Overhead near Niles about 1.7 miles in length, to be surfaced with plant-mixed surfacing over existing pavement and existing shoulders to be reconstructed. District IV, Route 5, Section C. Browne & Krull, Hayward, $44,885; Independent Construction Co., Oakland, $47,575. Contract awarded to Clements Construction Co., Hayward, $43,636.

ALAMEDA COUNTY—At the intersection of Davis Street with Douglas Drive-Pierce Avenue in the City of San Leandro, furnish and install a traffic signal system. District IV, Route 226. R. Flatland, San Francisco, $10,950; Hall Sloat Electric Co., Inc., Oakland, $10,952; Manny & Whitaker Inc., San Francisco, $10,960; Howard Electric Co., Gilroy, $11,306; Underground Electric Construction Co., Oakland, $11,307; L. H. Leonardi Electric Construction Co., San Rafael, $11,399; Abbett Electric Corp., San Francisco, $12,259. Contract awarded to Scott-Buttner Electric Co., Inc., Oakland, $10,880.

CONTRA COSTA COUNTY—Between 0.25 mile south of Monument and Martinez, a net length of about 5.3 miles; existing roadbed and reinforced concrete bridge to be widened; and plant-mixed surfacing to be placed on cement treated base and existing surfacing. District IV, Route 75, Sections B,H. Lee J. Immel, San Pablo, $279,715.90; Charles L. Harney Inc., San Francisco, $288,787.40; J. R. Armstrong, El Cerrito, $290,414.58; M.J.B. Construction Co., Stockton, $320,580; Peter Kiewit Sons' Co., San Francisco, $368,421. Contract awarded to Gallagher & Burk, Inc., Oakland, $278,314.73.

CONTRA COSTA COUNTY—In the City of Richmond at the intersection of Standard Avenue and Castro Street; construct a reinforced concrete box culvert and revise existing curb, sidewalk, etc. District IV, Route 69. Stanley H. Koller Construction, Crockett, $11,184.20; J. Henry Harris, Berkeley, $12,420.40; Lee J. Immel, San Pablo, $14,-154.10. Contract awarded to J. R. Armstrong, El Cerrito, $11,062.50.

DEL NORTE COUNTY—Portions along the Smith River, between 22.0 miles and 23.6 miles northeast of Crescent City a net length of about 0.3 mile, embankments to be reconstructed and concrete selected rock slope protection to be placed. District I, Route 1, Section D. Ted Schwartz, Grass Valley, $169,539; John Burman & Sons, Eureka, $188,648; J. Henry Harris, Berkeley, $193,842; Mercer Fraser Co., & Mercer Fraser Gas Co., Inc., Eureka, $198,662; Harms Bros., Sacramento, $212,-230; Norman I. Fadel, North Hollywood, $235,921. Contract awarded to Macco Corporation & Morrison-Knudsen Co., Inc., Paramount, $161,478.

HUMBOLDT COUNTY—City of Eureka, at the intersections of Fourth Street with A Street, F Street, H Street and J Street and Broadway with Seventh Street; traffic signal systems to be furnished and installed. District I, Route 1. Howard Electric Co., Gilroy, $29,104; Underground Electric Construction Co., Oakland, $34,753. Contract awarded to L. H. Leonardi Electric Construction Co., San Rafael, $27,-619.

HUMBOLDT COUNTY—Between Alton and Bridgeville, at Yager Creek, Grizzly Creek and Grizzly Creek State Park, two bridges and portion of roadway to be reconstructed. District I, Route 35, Section A,B. James H. McFarland, San Francisco, $52,466. Contract awarded to Humboldt Constructors Inc., Eureka, $40,056.

HUMBOLDT COUNTY—Furnishing and installing traffic signal systems in the City of Arcata, at the intersections of G Street with Seventh and 11th Streets. District I, Route 1. Howard Electric Co., Gilroy, $8,497; Underground Electric Construction Co., Oakland, $9,896; Roy P. Hayes, Sacramento, $10,880; Engineering Design Co., Burlingame, $10,-919. Contract awarded to L. H. Leonardi Electric Construction Co., San Rafael, $7,901.

KERN COUNTY—Between north city limits of Bakersfield and north of Kern River Bridge, about 0.6 mile of highway to be graded and surfaced with plant-mixed surfacing on cement treated base and three steel beam span bridges to be widened. District VI, Route 4, Section G. Griffith Co., Los Angeles, $468,774; Tumblin Co., Bakersfield, $477,262; Charles MacClosky Co., Los Angeles, $578,680.50; Stanley H. Koller Construction, Crockett, $666,427. Contract awarded to W. F. Maxwell, Los Angeles, $467,224.30.

LASSEN COUNTY—City of Susanville, on Main Street between Pine Street and Pacific Street, curbs and gutters to be reconstructed. District II, Route 29. Bill Katsaros Cement Contractor, Millbrae, $35,-080. Contract awarded to W. S. & Bruce F. Rogers Co., Madera, $24,438.

LOS ANGELES COUNTY—Between one mile west of Aqua Dulce Canyon Road and Palmdale, about 4.8 miles in length, roadway to be graded and surfaced with plant-mixed surfacing on untreated rock base. District VII, Route 23, Sections D,E. F. W. Case Corporation, Newhall, $507,275; Fredericksen & Kasler, Sacramento, $515,058.45; Cox Bros. Construction Co., Stanton, $525,259.80; L. A. and R. S. Crowe, El Monte, $541,540; Clyde W. Wood & Sons, Inc., North Hollywood, $542,-569.90; Dimmitt & Taylor, Monrovia, $546,843.13; Matich Brothers, Colton, $547,904.75; Clifford C. Bong & Co., Arcadia, $550,677.50; Griffith Co., Los Angeles, $567,765; J. A. Thompson & Son, Contractors, Inglewood, $581,976.60; R. R. Hensler, Sun Valley, $586,904.50; Schroeder & Co., Sun Valley, $611,326.20. Contract awarded to Munn and Perkins & Paul E. McCallum, Modesto, $455,037.

LOS ANGELES COUNTY—Between Whitaker Ridge and 2.6 miles south of Route 59 (portions), a net length of about 10.0 miles, to be resurfaced with plant-mixed surfacing. District VII, Route 4, Sections H,J. Schroeder & Co., Sun Valley, $286,-779; Griffith Co., Los Angeles, $295,440; Valley Paving Co., Pismo Beach, $308,385; G. W. Ellis Construction Co., North Hollywood, $309,900; Granite Construction Co., Watsonville, $313,865; R. R. Hensler, Sun Valley, $332,664; Cox Bros., Construction Co., Stanton, $385,115. Contract awarded to Gordon H. Ball and San Ramon Valley Land Co. & John M. Ferry, Berkeley, $286,443.

LOS ANGELES COUNTY—Between 0.6 mile south Route 158 and 0.4 mile north of north city limits of Los Angeles, about three miles in length, to be graded and surfaced with Portland cement concrete pavement on cement treated subgrade and seven bridges to be constructed. District VII, Routes 4,23,157,158, Sections Los Angeles, F. Guy P. Atkinson, Co., Long Beach, $3,222,646.25; Webb & White & W. J. Disteli, Los Angeles, $3,243,-075.80; Fredericksen & Kasler, Sacramento, $3,261,-910.85; Frederickson & Watson Construction Co. & M & K Corp., Oakland, $3,349,790.95; J. E. Haddock, Ltd., Pasadena, $3,420,768.40; A. Teichert & Son, Inc., Baldwin Park, $3,446,907; Charles MacClosky Co., L. A. & R. S. Crow and Matich Bros., Los Angeles, $3,449,820.30; Gordon H. Ball & San Ramon Valley Land Co., & Harms Bros., Berkeley, $3,460,317.42; Peter Kiewit Sons' Co., Arcadia, $3,533,685; Winston Bros., Co., Monrovia, $3,605,888.25; J. A. Thompson and Son, Ioglewood, $3,623,369.55; B. J. Ukropina, T. P. Polich, Steve Kral & John R. Ukropina, San Gabrial, $3,-694,521; Stolte Inc., Oakland, $3,761,941. Contract awarded to Griffith Co., Los Angeles, $3,060,396.35.

LOS ANGELES COUNTY—On Harbor Freeway between Jefferson Boulevard and 21st Street sanitary sewers, storm drains and bridge abutment and retaining wall to be constructed. District VII, Route 165. Flickinger-Welker Inc., Los Angeles, $324,-194.25; Matt J. Zaich, North Hollywood, $327,-101.50; Radich & Fergusson, Inc., Burbank, $335,-188.50; E. A. Irish, Contractor, Los Angeles, $362,-282.20; Charles MacClosky Co., Los Angeles, $368,995. Contract awarded to Oberg Bros. Construction Co., Inglewood, $319,856.

LOS ANGELES COUNTY—Between east 26th Street and Washington Boulevard over the tracks of the Atchinson, Topeka, and Santa Fe Railway and the Union Pacific Railroad, respectively, a reinforced concrete and structural steel overhead and a reinforced concrete overhead to be constructed and approaches thereto to be graded. District VII, Route 167, Section B, Ver. Griffith Co., Los Angeles, $1,192,666.89; Webb & White, Los Angeles, $1,-195,063.30; R. M. Price Co., Altadena, $1,196,-831.53; J. A. Thompson & Son, Inglewood, $1,-197,407.66; Charles MacClosky Co., Los Angeles, $1,205,722.45; Peter Kiewit Sons' Co., Arcadia, $1,215,901.64; W. E. Maxwell and C. G. Willis & Sons Inc., Los Angeles, $1,229,529.95; Guy F. Atkinson Co., Long Beach, $1,253,866.30; J. E. Haddock, Ltd., Pasadena, $1,257,043.80; Gerstenberger and Pierson, and W. J. Disteli, Los Angeles, $1,257,719.73; Winston Bros., Co., Monrovia, $1,-266,630.30; Bongiovanni Construction Co., North Hollywood, $1,350,541.58. Contract awarded to B. J. Ukropina, T. P. Polick, Steve Kral & John R. Ukropina, San Gabriel, $1,174,577.10.

LOS ANGELES COUNTY—Between Inglewood Avenue and Normandie Avenue about 3.6 miles in length, to be graded and paved with asphalt concrete pavement and a steel girder bridge to be constructed. District VII, Route 175, Sections Rdo B, Tor, Gar, A. J. A. Thompson & Son, Inglewood, $782,420.70; Griffith Co., Los Angeles, $803,910.55; Tomei Construction Co., Van Nuys, $813,443; Warren Southwest Inc., Torrance, $873,808. Contract awarded to J. E. Haddock, Ltd., Pasadena, $772,-539.70.

MERCED COUNTY—Between Bear Creek and Buhach Road, about 4.2 miles in length to be widened and resurfaced with plant-mixed surfacing on untreated rock base. District X, Route 4, Section C. Granite Construction Co., Watsonville, $185,-412.70; Valley Paving Co., Pismo Beach, $190,691; Frederickson & Watson Construction Co., Oakland, $207,605.60; M. J. Ruddy & Son, Modesto, $211,-481.40; M.J.B. Construction Co., Stockton, $219,-965; Chas. L. Harney Inc., San Francisco, $270,075. Contract awarded to Standard Materials Inc., Modesto, $174,994.

LOS ANGELES COUNTY—In and adjacent to the Cities of Pomona and Claremont, between San Dimas Avenue and Alexander Avenue highway lighting and illuminated sign system to be furnished and installed. District VII, Route 26, Section C, Pom, Cla. C. D. Draucker Inc., Los Angeles, $170,530; Paul R. Gardner, Ontario, $171,349; Electric and Machinery Service, Inc., South Gate, $173,162; Fischbach and Moore Inc., Los Angeles, $177,346; A. S. Schulman Electric Co., Los Angeles, $179,267; Westates Electrical Construction Co., Los Angeles, $182,438. Contract awarded to Ets-Hokin & Galvan, Wilmington, $168,479.

LOS ANGELES COUNTY—In and near the Cities of Los Angeles and Inglewood on Manchester Boulevard, between Osage Avenue and Freeman Avenue about 0.6 mile in length; existing shoulders to be excavated and reinforced with imported subbase material and untreated rock base, and the entire roadbed to be surfaced with plant-mixed surface. District VII, Route 174, Section A, LA, Ing. Jesse S. Smith, Glendale, $94,221; George Savala Paving Co., Los Angeles, $95,302.50; McAmis & Baker, Gardena, $99,760; C. O. Sparks Inc. & Mundo Engineering Co., Los Angeles, $101,-079.25; J. A. Thompson & Son, Contractors, Inglewood, $106,837.50; Vernon Paving Co., Los Angeles, $107,700; Flickinger-Welker Inc., Los Angeles, $112,287.50. Contract awarded to Warren Southwest Inc., Torrance, $90,971.75.

MARIPOSA COUNTY—Between Mariposa and two miles northerly, about two miles in length to be graded and surfaced with plant-mixed surfacing on untreated rock base. District X, Route 65, Section C. Granite Construction Co., Watsonville, $197,-433; Eaton and Smith, San Francisco, $198,877.10; Karl C. Harmeling, Stockton, $202,613. Contract awarded to Close Building Supply Inc., Hayward, $186,628.70.

MONTEREY AND SANTA BARBARA COUNTIES—Between Chualar and Spence Underpass and in the City of Santa Maria; between Railroad Avenue and the west city limits of Santa Maria, seal coats to be applied. District V, Route 2, 148, Sections B, SMra. Baun Construction Co., Fresno, $11,-682; Granite Construction Co., Watsonville, $11,-880; Madonna Construction Co., San Luis Obispo, $12,359. Contract awarded to Valley Paving Co., Pismo Beach, $10,760.

NEVADA COUNTY—Between near new Route 15 and 0.1 mile west of west city limits of Nevada City, about 1.0 mile in length, to be graded and road-mixed cement treated base and armor coat to be placed. District III, Route 25, Sections Nev, C,A. W. H. Darrough & Sons, Yuba City, $158,946.80; Ted Schwartz, Grass Valley, $161,712.50; Close Building Supply Inc., Hayward, $168,973.50; Paul E. McCollum, Richmond, $171,836.16; Huntington Bros., Napa, $176,500; Harms Bros., Sacramento, $177,022.70; M. Malfitano & Son Inc. & Vega Engineering & Grading Co., Pittsburg, $178,721.90; H. Earl Parker, Inc., Marysville, $189,589.50; J. Henry Harris, Berkeley, $215,705.40; M.J.B. Construction Co., Stockton, $235,342. Contract awarded to John G. Mehren, Sacramento, $144,-965.95.

ORANGE COUNTY—Across the Santa Ana River approximately 1.5 miles north of Olive, a reinforced concrete bridge to be constructed and approaches to be graded and surfaced with plant-mixed surfacing on untreated rock base. District VII, Route 175, Section B. Charles MacClosky, Co., San Francisco, $450,773; O. B. Pierson, Bellflower, $451,-285.50; W. F. Maxwell, Los Angeles, $456,868.50; John Strona, Pomona, $466,457.20; Webb & White, Los Angeles, $490,770; J. A. Thompson & Son, Inglewood, $499,492; Byerts & Sons and Geo. K. Thatcher, Los Angeles, $507,074.50; Fredericksen & Kasler, Sacramento, $520,974.40; Guy F. Atkinson Co., Long Beach, $556,084. Contract awarded to R. M. Price Co., Altadena, $416,222.

ORANGE COUNTY—On Huntington Beach Boulevard between Garfield Avenue and Smeltzer Avenue, about 3.2 miles in length, to be graded and surfaced with plant-mixed surfacing on untreated rock base. District VII, Route 171, Section A. Sully-Miller Contracting Co., Long Beach, $384,484.90;

Baker and Pollock, Ventura, $413,101.50; M. S. Mecham & Sons, South Gate, $420,063; Cox Bros. Construction Co., Stanton, $421,176.50. Contract awarded to R. J. Noble Co., Orange, $352,287.

PLUMAS COUNTY—At Willow Creek, 4.3 miles west of the west city limits of Portola, an existing bridge to be removed, a reinforced concrete culvert to be constructed and approaches to be graded and surfaced with imported base material cement treated, and plant-mixed surfacing. District II, Route 21, Section F. Friant Construction Co., Fresno, $27,658.50; Ted Schwartz, Grass Valley, $28,359.50. Contract awarded to Paul E. McCollum, Richmond, $25,533.75.

SAN BERNARDINO COUNTY—On Euclid Avenue between 0.2 mile north of Pine Avenue and Eucalyptus Avenue about 2.3 miles in length, cement treated base borders to be constructed, plant-mixed surfacing to be placed and seal coats to be applied. District VIII, Route 192, Section A. Matich Bros. and Matich Bros. Paving Co., Colton, $43,692.50; Ralph J. Laird, La Verne, $44,453; E. S. & N. S. Johnson, Fullerton, $46,255.80; George Herz & Co., San Bernardino, $46,992; Robert E. L. Parker Co., Claremont, $47,779.50; Vernon Paving Co., Los Angeles, $48,362.90; E. L. Yeager Co., Riverside, $50,861.90; James E. Roberts, San Bernardino, $54,920. Contract awarded to Corona Asphalt Paving Co., Corona, $42,035.

SAN DIEGO COUNTY—Between 3.3 miles northwest of Warner's and San Luis Rey River, a distance of about 1.2 miles in length, to be graded and bituminous surface treatment applied. District XI, Route 78, Section D. Lowe & Watson, San Bernardino, $51,836.95; Dimmitt & Taylor, Monrovia, $51,842.06; Einer Bros, Inc., Escondido, $54,912; Matich Bros., and Matich Bros. Paving Co., Colton, $57,989; James E. Roberts, San Bernardino, $58,443.50; Clifford C. Bong & Co., Arcadia, $59,180; E. C. Young, San Fernando, $62,356.90; Robert E. L. Parker Co., Claremont, $62,562.60; Cox Bros. Construction Co., Stanton, $64,886.75; E. S. & N. S. Johnson, Fullerton, $65,512.50; Morris Van Meter, Bonita, $66,761.70; Elco Construction, Bell, $68,841.65; Ralph B. Slaughter, Julian, $69,718.50; E. L. Yeager Co., Riverside, $70,646.50; Walter H. Barber, La Mesa, $72,674.20. Contract awarded to Arthur A. Johnson, Laguna Beach, $50,655.

SAN DIEGO COUNTY—In the City of San Diego between Torrey Pines Mesa and Penasquitos Creek, about 2.3 mile of roadway to be graded, widened, and resurfaced. District XI, Route 2. Clifford C. Bong & Co., Arcadia, $282,805; R. E. Hazard Contracting Co., San Diego, $299,292.10; Daley Corp., San Diego, $299,927.25; Cox Bros. Construction Co., Stanton, $304,849.60. Contract awarded to Griffith Co., Los Angeles, $282,067.50.

SAN JOAQUIN AND CALAVERAS COUNTIES—Between 0.1 mile west of San Joaquin County line and Valley Springs, about 5.2 miles in net length, to be widened and surfaced with plant-mixed surfacing on untreated rock base. District X, Route 24, Sections A; A,B. M. J. Ruddy & Son, Modesto, $262,603.20; Granite Construction Co., Watsonville, $307,381; Harms Bros., Sacramento, $315,567; E. A. Forde Co., San Anselmo, $320,450.60; Gordon H. Ball & San Ramon Valley Land Co., Berkeley, $320,030.30. Contract awarded to Claude C. Wood Co., Lodi, $258,921.

SAN JOAQUIN COUNTY—Between Ripon and 0.7 mile west of Austin Road 4.3 miles in length, two additional lanes, to be graded and surfaced with Portland cement concrete on cement treated subgrade; resurface the existing pavement with plant-mixed surfacing; and construct two reinforced concrete overcrossings; to provide a four-lane divided highway. District X, Route 4, Sections Rip, A. Gordon H. Ball and San Ramon Valley Land Co., Berkeley, $1,128,457.65; Fredrickson & Watson Construction Co., Oakland, $1,137,890.25; B. J. Ukropina, T. P. Polich, Steve Kral & John R. Ukropina, San Gabriel, $1,156,078.75; Stolte Inc. & Stephens Trucking Co., Oakland, $1,230,993; Guy F. Atkinson Co., South San Francisco, $1,242,314.95; A Teichert & Son, Inc., Sacramento, $1,297,134.50. Contract awarded to Lord & Bishop and M.J.B. Construction Co., Stockton, $1,081,046.60.

SAN JOAQUIN COUNTY—About 2.5 miles east of Tracy between Banta Road and Grant Line Road about 1.9 miles in length, border trenches to be excavated and backfilled with cement treated base material and plant-mixed surfacing placed on traveled way and shoulders. District X, Route 5, Section B. Claude C. Wood Co., Lodi, $80,211; S. M. McGaw Co. Inc., Stockton, $80,312.41; Clements Construction Co., Hayward, $80,876; M. J. Ruddy & Son, Modesto, $82,098.50; Stephens Trucking Co., French Camp, $83,899.20; Stanfield & Moody, Tracy, $87,012.50; Chas. L. Harney, Inc., San Francisco, $91,755. Contract awarded to A. Teichert & Son, Inc., Sacramento, $79,460.

SAN MATEO COUNTY—Between Route 68 and Southern Pacific Railroad Crossing about 0.8 mile in length to be graded and surfaced with plant-mixed surfacing over existing pavement and on cement treated base. District IV, Route 107. Piombo Construction Co., San Francisco, $84,372.80; J. Henry Harris, Berkeley, $85,344.40; Chas. L. Harney, Inc., San Francisco, $86,602; Leo F. Piazza Paving Co., San Jose, $93,207.38; S.A.E. Co., Redwood City, $93,761. Contract awarded to L. C. Smith Co., San Mateo, $71,260.20.

SHASTA COUNTY—On Eureka Way, between 11th Street and Court Street in Redding, about 0.2 mile in length to be widened and untreated rock base and plant-mixed surfacing to be placed. District II, Route 20. Fredericksen & Watson Construction Co., Oakland, $23,675; Morgan Construction Co., Redding, $25,426. Contract awarded to M. W. Brown, Redding, $21,709.

SISKIYOU COUNTY—At Seiad Creek, about 62.4 miles northeast of Humboldt County line, a reinforced concrete bridge and approaches to the constructed. District II, Route 46, Section B. Underground Construction Co., Oakland, $88,950; R. G. Clifford & C. O. Bodenhamer, Berkeley, $93,182; A. A. Edmondson, Butte City, $107,919; Stanley H. Koller Construction, Crockett, $109,477; Ted Schwartz, Grass Valley, $119,477.50 Contract awarded to James B. Allen, San Carlos, $76,509.

SISKIYOU COUNTY—Between Spring Street and First Street, near Dunsmuir, a bridge to be widened and approaches about 0.5 mile in length to be graded and surfaced with plant-mixed surfacing on cement treated base. District II, Route 3, Sections, Dmr, A. John C. Gist, Sacramento, $679,399; A Teichert & Son, Inc., Sacramento, $801,897. Contract awarded to Charles MacClosky Co., San Francisco, $651,648.

SOLANO AND YOLO COUNTIES—Between Route 6 and 0.5 mile north of Woodland Wye, about 2.5 miles in length to be graded and paved with Portland cement concrete and two reinforced concrete bridges to be constructed. District III, Route 7, Sections E,A. B. J. Ukropina, T. P. Polich, Steve Kral & John R. Ukropina, San Gabriel, $626,704.10; Fredericksen & Watson Construction Co., Oakland, $651,554.39; A. Teichert & Sons, Inc., Sacramento, $655,185.50; Guy F. Atkinson Co., South San Francisco, $663,465.95; Fredericksen Bros., Emeryville, $669,742.55; George Pollock Co., Sacramento, $682,926.25; Harms Bros., Sacramento, $684,223.85. Contract awarded to Gordon H. Ball & San Ramon Valley Land Co., Berkeley, $620,917.48.

SONOMA COUNTY—Across Petaluma Creek and over North-Western Pacific Railroad Company tracks, about one mile east of Petaluma, a reinforced concrete girder bridge to be constructed. District IV, Route 1, Section F. Charles MacClosky Co., Los Angeles, $932,436; Tumblin Co., Bakersfield, $939,574; Williams & Burrows Inc., & Carl N. Swenson Co., Inc., South San Francisco, $954,352; Chas. L. Harney, Inc., San Francisco, $954,698.50; Dan Caputo, San Jose, $960,524; Fredrickson & Watson Construction Co. & M & K Corporation, Oakland, $977,735.70; Lew Jones Construction Co., San Jose, $995,245.60; Stolte Inc., Oakland, $1,004,938.50; Ben C. Gerwick Inc., & Peter Kiewit Sons' Co., San Francisco, $1,020,555; Rothschild, Raffin & Weirick & Pacific Bridge Co., San Francisco, $1,036,356; The Duncanson-Harrelson Co., Richmond, $1,043,822. Contract awarded to Erickson-Phillips & Weisberg, Concord, $850,063.75.

TEHAMA COUNTY—Betweent 2.9 miles south of Los Molinos and 4.3 miles north of Dairyville, a net length of about 1.0 mile of bridge approaches to he widened and surfaced with plant-mixed surfacing. District II, Route 3, Sections A,D. Butte Creek Rock Co. Chico, $45,772; Fredrickson & Watson Construction Co., Oakland, $47,945.25. Contract awarded to Clements Construction Co., Hayward, $38,070.85.

VENTURA COUNTY—On Ventura Boulevard between Calleguas Road and Central Avenue highway lighting and illuminated sign system to be furnished and installed. District VII, Route 2, Section B. Fischbach and Moore, Inc., Los Angeles, $34,622; C. D. Draucher, Inc., Los Angeles, $35,253; Westates Electrical Construction Co., Los Angeles, $35,508; Ets-Hokin & Galvan, Wilmington, $35,912; Ed Seymour, Long Beach, $35,925; A. S. Schulman Electric Co., Los Angeles, $36,769. Contract awarded to Electric and Machinery Service, Inc., South Gate, $33,548.

VENTURA COUNTY—Between Alvarado Avenue and Meiners Oaks and Matilija Hot Springs Road, about 2.7 miles in length, to be graded and surfaced with plant-mixed surfacing on untreated rock base, and construct two bridges. District VII, Route 138, Section B. Dimmitt & Taylor, Monrovia, $359,848.25; Roland T. Reynolds & Thomas Construction Co., Anaheim, $369,695.05; Valley Paving Co., Pismo Beach, $379,924.40; Frederickson & Kasler, Sacramento, $399,747.60. Contract awarded to W. F. Maxwell & Hermreck & Easter, Los Angeles, $293,067.80.

YOLO COUNTY—Between Winters & Madison, about 10.8 miles in length, to be surfaced with plant-mixed surfacing and four bridges are to be widened. District III, Route 90, Sections Win, A. W. C. Railing, Woodland, $109,767.25; Harms Bros., Sacramento, $113,160.75; E. A. Forde Co., San Anselmo, $121,342.50; Fredrickson Bros., Emeryville, $132,334.90. Contract awarded to A. Teichert & Son, Inc., Sacramento, $102,141.25.

YOLO COUNTY—Near Monument School about 5.8 miles northwesterly of Sacramento on the Sacramento-Woodland River Road, about 0.4 mile in length to be graded and plant-mixed surfacing to be placed on cement treated base. District III, Route 50, Section F. A. Teichert & Son, Inc., Sacramento, $34,965; Brighton Sand & Gravel Co., Sacramento, $36,241. Contract awarded to W. C. Railing, Woodland, $26,155.50.

F. A. S. County Roads

FRESNO COUNTY—Across Cole Slough, about nine miles south of Selma a reinforced concrete slab bridge to be constructed. District VI, Route 568. Friant Construction Co., Fresno, $24,043; Gene Richards, Inc., Fresno, $24,362.62; E. G. Perham, Los Angeles, $25,703.50; Kaweah Construction Co., Visalia, $27,754.10; Stanley H. Koller Construction, Crockett, $35,135. Contract awarded to F. Fredenburg, Temple City, $23,988.

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DEL NORTE COUNTY—At Wilson Creek about seven miles north of Klamath and at Jordan Creek about 3.7 miles north of Crescent City existing bridge to be repaired and reinforced concrete bridge to be constructed and approaches to be graded and surfaced with road-mixed surfacing. District I, Route 1, 71, Sections A,A. G. M. Carr Co. & Bati Rocca, Santa Rosa, $34,127.50. Contract awarded to James H. McFarland, San Francisco, $29,312.

EL DORADO COUNTY—Echo Summit maintenance buildings to be painted. District III, Route 11, Section I. Bill Reid Painting Service, Sacramento, $3,497; R. A. Luther, Hayward, $4,138; Earl G. Corliss & Sons, Los Angeles, $4,479; Edgar E. Wilson, Yuba City, $5,965; Claude F. McMillin, Chico, $6,434. Contract awarded to Robinson Paint Co., Marysville, $2,882.

FRESNO COUNTY—City of Fresno, between Cherry Avenue and Santa Clara Street. District VI, Route 4. Robinson Electric, Fresno, $5,568; Dale

Electric, Fresno, $5,900; L. H. Leonardi Electric Construction Co., San Rafael, $5,998; McCrory Electric Co., Fresno, $6,412. Contract awarded to A-C Electric Co., Bakersfield, $5,565.

FRESNO COUNTY—At the interesections of Broadway with Ventura Avenue, Elm Avenue, C Street with California Avenue and C Street with Tulare Street, traffic signal systems and highway lighting to be furnished and installed and modified. District VI, Route 4,41,125. Dale Electric, Fresno, $21,200. Contract awarded to A-C Electric Co., Bakersfield, $19,395.

HUMBOLDT COUNTY—Between Arcata & Del Norte county line and at Buckhorn Washout about four miles east of Blue Lake embankments, base and surfacing to be restored, slope protection to be constructed and two timber bridges to be repaired. District I, Route 1, 20. Sections I, J, K, B. Contract awarded to Mercer, Fraser Co., & Mercer, Fraser Gas Co., Inc., Eureka, $289,653.

HUMBOLDT COUNTY—Between Pepperwood and Paradise Park, about 1.7 miles in length to be surfaced with plant-mixed surfacing on cement treated base. District I, Route 1, Section D. Mercer, Fraser Co., & Mercer, Fraser Gas Co., Inc., Eureka, $121,205. Contract awarded to Fredrickson Bros., Emeryville, $115,298.50.

HUMBOLDT COUNTY—Between Fields Landing and 0.5 mile south of south city limits of Eureka, about 3.4 miles in length to be surfaced with plant-mixed surfacing on cement treated base. District I, Route 1, Section G. Fredrickson Bros., Emeryville, $222,745.50. Contract awarded to Mercer, Fraser Co., & Mercer, Fraser Gas Co., Inc., Eureka, $213,765.

IMPERIAL COUNTY—Between Standard Canal and Main Street of Calipatria, about 3.3 miles in length the existing road to be widened and surfaced with road-mixed surfacing on imported base material. District XI, Route 201, Section C. Clifford C. Bong, & Co., Arcadia, $93,631; Rankin & Booth, Playa del Rey, $98,591; Marks Bros. Construction Co., El Centro, $104,976; R. R. Hensler, Sun Valley, $110,864; E. C. Young, San Fernando, $113,-253; Clyde W. Wood & Sons, Inc., North Hollywood, $114,004; James E. Roberts, San Bernardino, $118,-560; Basich Bros., Construction Co., N. L. Basich & R. L. Basich, South San Gabriel, $121,302; Dimitt & Taylor, Monrovia, $122,491; Geiser Construction Co., Buena Park, $126,665.30; G. W. Ellis Construction Co., North Hollywood, $131,776; Webb & White, Los Angeles, $143,923. Contract awarded to Cox Bros., Construction Co., Stanton, $92,044.

INYO COUNTY—Across Los Angeles Aqueduct about three miles south of Olancha, an existing steel beam span bridge to be widened. District IX, Route 23, Section I. Friant Construction Co., Fresno, $28,591.25; Norman I. Fadel, North Hollywood, $30,270. Contract awarded to Owl Truck & Construction Co., Compton, $20,717.

KERN COUNTY—About one mile west of junction of Route 58 with Route 140 existing cattlepass to be reconstructed. District VI, Route 58, Section D. Irving Guinn, Contractor, Bakersfield, $6,556; Oilfields Trucking Co., Bakersfield, $7,032; Paul E. Woof, Fresno, $7,938; Friant Construction Co., Fresno, $8,778.75; Vic Martin, Pasadena, $9,650.80; E. S. & N. S. Johnson, Fullerton, $9,475. Contract awarded to D. E. Higday, Temple City, $6,502.

KERN COUNTY—On Route 4, between Snow Road and Cawelo. District VI, Route 4, Sections D,E. Howard Electric, Gilroy, $10,711. Contract awarded to A-C Electric Co., Bakersfield, $7,715.

KINGS COUNTY—Between Kansas Avenue and one mile north of Corcoran, about 7.2 miles in length, to be graded and a reinforced concrete bridge to be constructed. District VI, Route 135, Section B. Gordon H. Ball & San Ramon Valley Land Co., Berkeley, $257,137.40; Gene Richards, Inc., Fresno, $261,208.70; Baun Construction Co., Fresno, $261,-649.70; R. R. Hensler, Sun Valley, $266,921.50; Valley Paving Co., Pismo Beach, $269,883; Huntington Bros., Napa, $270,206; Fredericksen & Kasler, Sacramento, $280,304.50; Stephens Trucking Co., French Camp, $280,476.90; Clyde W. Wood & Sons, Inc., North Hollywood, $283,702.40; Madonna Construction Co., San Luis Obispo, $283,924; W. H. Darrough & Sons, Yuba City, $287,189; Griffith Co., Los Angeles, $290,000.40; Clande C. Wood Co., Lodi, $311,409.30; J. E. Haddock, Ltd., Pasadena, $314,352.90. Contract awarded to Oilfields Trucking Co., Bakersfield, $250,217.20.

LOS ANGELES COUNTY—At the intersections of Manchester Boulevard with Florence Avenue and with Hindry Avenue in and adjacent to the City of Inglewood, traffic signal systems to be modified. District VII, Route 174, Section A. Westates Electrical Construction Co., Los Angeles, $8,030; Fischbach and Moore, Inc., Los Angeles, $8,428; Electrical and Machinery Service, Inc., South Gate, $8,566. Contract awarded to C. D. Draucker, Inc., Los Angeles, $7,725.

LOS ANGELES COUNTY—City of Pasadena between the Orange Grove Avenue on Ramp and Holly Street, about 0.2 mile of roadside areas to be prepared and planted with ground cover installation of slope stabilization and a sprinkler system. District VII, Route 161. F. A. Tetley & Son, Corona, $16,764.15; K.E.C. Co., Inc., Long Beach, $17,164.32. Contract awarded to Jannoch Nurseries, Altadena, $14,869.20.

LOS ANGELES COUNTY—On Lakewood Boulevard, between Center Street and Gardendale Street a distance of about 1.6 miles in length, to be widened and asphalt concrete to be placed on untreated rock base and on existing pavement. District VII, Route 168, Section A. C. O. Sparks, Inc., & Mundo Engineering Co., Los Angeles, $189,604; Vido Kovacevich Co., Rosemead, $191,270; George Savalo Paving Co., Los Angeles, $193,035; Boddum Construction Co., Long Beach, $193,294.50; Jesse S. Smith, Glendale, $193,920; M. S. Mecham & Sons, South Gate, $194,314; Webb & White, Los Angeles, $194,-363; McAmis & Baker, Gardena, $196,971; Baker and Pollock, Ventura, $197,726.50; Eric L. Peterson, Long Beach, $204,412; Warren Southwest, Inc., Torrance, $207,676.30; H & H Construction Co., Long Beach, $208,568.50; Sully-Miller Contracting Co., Long Beach, $219,299; Cox Bros. Construction Co., Stanton, $220,842; Griffith Company, Los Angeles, $223,416; Osborn Company, Pasadena, $235,886. Contract awarded to Sheets Construction Co., Gardena, $184,059.

LOS ANGELES COUNTY—At the intersections of Foothill Boulevard with Virginia Avenue, Orange Avenue, Azusa Avenue and Pasadena Avenue in the City of Azusa, traffic signal systems and highway lighting to be furnished and installed or modified. District VII, Route 9. Electric and Machinery Service, Inc., South Gate, $20,220; Fischbach and Moore, Inc., Los Angeles, $21,655; Drury Electric Co., San Bernardino, $24,062. Contract awarded to Westates Electrical Construction Co., Los Angeles, $19,-157.

LOS ANGELES COUNTY—Between Hollywood Boulevard and Santa Monica Boulevard, about 1.0 mile of roadside areas to be prepared and planted with ground cover trees and shrubs, installation of slope stabilization, and pave a portion of the median areas with plant-mixed surfacing. District VII, Route 2. K.E.C. Co., Inc., Long Beach, $66,595.11; Justice-Dunn Co., Oakland, $70,718.19; James E. Boothe, Compton, $72,483.14; Stephen L. Vistica, San Mateo, $82,591. Contract awarded to Jannoch Nurseries, Altadena, $55,133.20.

LOS ANGELES COUNTY—At the intersection of Verdugo Boulevard with Desanco Drive-Alta Canyada Road, traffic signal system and highway lighting to be furnished and installed. District VII, Route 61, Section E. Westates Electrical Construction Co., Los Angeles, $7,721; Electric & Machinery Service Inc., South Gate, $7,893; Fischbach and Moore, Inc., Los Angeles, $7,942. Contract awarded to C. D. Draucker, Inc., Los Angeles, $7,695.

LOS ANGELES COUNTY—City of San Fernando, at the intersection of Maclay Avenue with San Fernando Road drainage facilities to be modified. District VII, Route 4,9. Service Construction Co. of Southern California, Sun Valley, $20,650; Norman I. Fadel, North Hollywood, $24,457. Contract awarded to D. E. Higday, Temple City, $12,722.

LOS ANGELES COUNTY—In and adjacent to the City of Pasadena, at the intersection of Foothill Boulevard with Michillinda Avenue traffic signals and highway lighting to be furnished and installed and channelization to be constructed. District VII, Route 9, Section E. Fischbach and Moore, Inc., Los Angeles, $24,584.50; Westates Electrical Construction Co., Los Angeles, $24,681; C. D. Draucker, Inc., Los Angeles, $24,924.50. Contract awarded to Electric & Machinery Service, Inc., South Gate, $23,580.

LOS ANGELES COUNTY—Between Southern Pacific Railroad Overhead and Castaic Junction, roadside development to be performed. District VII, Route 4, Section A. F. A. Tetley & Son, Corona, $2,504.75; K.E.C. Co., Inc., Long Beach, $2,667.30. Contract awarded to Jannoch Nurseries, Altadena, $2,262.

MENDOCINO COUNTY—Across Russian River about 0.9 mile east of Ukiah a reinforced concrete slab and welded steel girder bridge to be constructed and about 0.9 mile of approaches to be graded and surfaced with plant-mixed surfacing on cement treated base. District I, Route 70, Section A. F. S. Rolandi, Jr., Inc., Le Baeuf & Dougherty Construction Co., and Erickson & Pierson, Richmond, $328,731.50; C. K. Moseman, Redwood City, $329,268.70; Bishop, Younger, Bradley Co., San Francisco, $336,817; Gordon H. Ball & San Ramon Valley Land Co., Berkeley, $343,283.24; Stanley H. Koller Construction, Crockett, $347,125.90; Ace Excavators & Bos Construction Co., Berkeley, $354,878.55; Chas. MacClosky Co., San Francisco, $368,419.30; Ted Schwartz, Grass Valley, $382,592. Contract awarded to L. Neilson, Orinda, $303,867.75.

PLUMAS COUNTY—At Indian Creek near Junction of State Routes 21 and 83 a steel plate girder bridge and about 0.3 mile of bridge approaches to be constructed and existing truck scales to be removed and reset. District II, Route 21, Section B. Ace Excavators & Bos Construction Co., Berkeley, $206,-692.60; Chaney Construction Co., Los Angeles, $223,017.60; Ted Schwartz, Grass Valley, $224,-902.30; Victor Weidmer, Penryn, $248,184. Contract awarded to M. W. Brown & R. E. Hertel, Redding, $194,810.

PLUMAS AND BUTTE COUNTIES—At various locations across North Fork Feather River between Howells and Pulga 5 existing steel bridges to be cleaned and painted. District II, Route 21, Sections B, A, C. J. S. Morris Co., Berkeley, $37,765; Robert A. Thompson, San Francisco, $42,740; Deemer & Deemer, San Francisco, $44,900; R. W. Reade & Co., Berkeley, $51,607; Klaas Bros., Los Angeles, $54,743; Orrell-Keefe Co., Oakland, $58,697; Stanley H. Koller Construction, Crockett, $98,700. Contract awarded to D. Zelinsky & Sons, San Francisco, $22,230.

SACRAMENTO COUNTY—Between Ben Ali and Placer County line seven reinforced concrete bridges and miscellaneous road work to be constructed. District III, Route 3, Section B. Charles MacClosky Co., San Francisco, $645,818; D & H Construction Co. & Stolte Inc., Sacramento, $663,676; Gordon Ball & San Ramon Valley Land Co., Berkeley, $694,-273.60; Tumblin Co., Bakersfield, $697,374; Trewhitt-Shields & Fisher, Fresno, $707,413.75; Dan Caputo, San Jose, $729,619.50; A. Teichert & Son, Inc., Sacramento, $734,346.50; Fredrickson & Watson Construction Co., & M & K Corporation, Oakland, $741,136.10; Stanley H. Koller Construction, Crockett, $743,601; Nomellini Construction Co., Stockton, $809,764.50; Lew Jones Construction Co., San Jose, $812,152.75. Contract awarded to B. J. Ukropina, U. P. Polich, Steve Kral & John R. Ukropina, San Gabriel, $596,879.75.

SACRAMENTO COUNTY—At Alder Creek about 13.8 miles northeast of Sacramento, about 0.4 mile in net length, additional two-lane roadbed to be graded and protective embankment and riprap to be constructed. District III, Route II, Section B. Ruby Construction Co., Inc., Sacramento, $72,242.-50; Brighton Sand & Gravel Co., Sacramento, $79,-897.50; Ted Schwartz, Grass Valley, $82,042; George Pollock Co., Sacramento, $84,483.75; Lord & Bishop, Sacramento, $85,500.50; Condick Co., Berkeley, $88,870; Thomas Construction Co., Fresno, $92,718; Ace Excavators & Bos Construction Co., Berkeley, $93,664.50; Huntington Brothers, Napa, $98,745.50. Contract awarded to Teichert & Son, Inc., Sacramento, $69,716.50.

SAN BERNARDINO COUNTY—At the intersection of State Hikhway Routes 31 and 59. District VIII, Route 31,59, Sections B,A. Electric and Machinery Service, Inc., South Gate, $5,397; Ed Seymour, Long Beach, $5,400; Harry F. Brewer, Long Beach, $5,853; Paul R. Gardner, Ontario, $5,-980; Fischbach & Moore, Inc., Los Angeles, $7,092. Contract awarded to Drury Electric Co., San Bernardino, $4,879.

SAN BERNARDINO COUNTY—On Route 31 between Palmdale Road and Forest Avenue. District VIII, Route 31, Section C. Gardner Construction Co., Redlands, $8,566; George Herz & Co., San Bernardino, $8,884; Robert E. L. Parker Co., Claremont, $11,260; R. A. Erwin, Colton, $12,930; E. L. Yeager Co., Riverside, $13,526; D. E. Higday, Temple City, $13,621; Lowe & Watson, San Bernardino, $14,506. Contract awarded to James E. Roberts, San Bernardino, $8,540.

SANTA CLARA COUNTY—At the intersections of El Camino Real with Arastradero Road-Charleston Road and Bayshore Highway with Stierlin Road, traffic signal systems to be furnished and installed, highway lighting to be modified and channelization to be constructed. District IV, Route 2, 68, Sections A,A. L. C. Smith Co., San Mateo, $39,912; J. Henry Harris, Berkeley, $46,954.50; R. Flatland, San Francisco, $48,088; S.A.E. Co., Redwood City, $49,367.65. Contract awarded to Howard Electric Co., Gilroy, $38,719.75.

SANTA CRUZ COUNTY—In Seacliff Beach State Park, about eight miles east of Santa Cruz, an existing timber trestle pier to be repaired. District IV, Route Seacliff Beach State Park. E. G. Perham, Los Angeles, $20,410; Payne Construction Co., Oakland, $20,420; G. W. Davis, Watsonville, $20,575; Stanley H. Koller Construction, Crockett, $22,500; Stolte Inc., Oakland, $22,792; H. H. Anderson, Hayward, $23,400; C. B. Tuttle, Long Beach, $23,916; Granite Construction Co., Watsonville, $24,740; Hart & Hynding, Inc., San Francisco, $24,900; Lew Jones Construction Co., San Jose, $25,500; Al Erickson & Son., Napa, $25,600; Geo. C. Renz Construction Co., Inc., Gilroy, $25,960; Condick Co., Berkeley, $26,970; Dan Caputo, San Jose, $28,025; Bos Construction Co., Berkeley, $29,550. Contract awarded to Barton Construction Co., Oakland, $20,-238.40.

SAN DIEGO COUNTY—City of San Diego, at the intersections of Pacific Highway with Rosecrans Street-Congress Street and with Laurel Street, Harbor Drive with 28th Street and Lytton Street with Rosecrans Street modification of traffic signal systems and highway lighting to be furnished and installed and channelization to be constructed. District XI, Route 2, 12. California Electric Works, San Diego, $51,757.60; Drury Electric Co., San Bernardino, $52,895.92. Contract awarded to Ets-Hokin & Galvan, San Diego, $45,318.10.

SAN MATEO COUNTY—City of San Mateo, at the intersection of El Camino Real with Hillsdale Boulevard, traffic signal system and highway lighting to be revised and channelization to be constructed. District IV, Route 2. J. Henry Harris, Berkeley, $50,-911.25; R. Flatland, San Francisco, $52,775.50. Contract awarded to L. C. Smith Co., San Mateo, $43,439.80.

SAN MATEO COUNTY—On Skyline Boulevard between Edgemar Road and Alemany Boulevard in Daly City, about 2.3 miles in length to be graded and surfaced with plant-mixed surfacing on untreated rock base; and install highway lighting. District IV, Route 55, Section A, D1C. J. A. Thompson & Son, Inglewood, $585,992.40; Fredrickson & Watson Construction Co., & M & K Corporation, Oakland, $599,599; L. C. Smith Co., San Mateo, $622,-434.40; Peter Kiewit Sons' Co., San Francisco, $651,922; McCammon-Wonderlich Co., Palo Alto, $652,786.60; Granite Construction Co., Watsonville, $655,395.50; Chas. L. Harney, Inc., San Francisco, $655,924.20; S.A.E. Co., Redwood City, $661,096; The Fay Improvement Co., San Francisco, $668,-516.15; Piombo Construction Co., & Parish Bros., San Francisco, $674,623; Fredericksen & Kasler, Sacramento, $687,719.10; Eaton & Smith, San Francisco, $707,577; L. A. & R. S. Crow, El Monte, $714,601.30; Guy F. Atkinson Co., South San Francisco, $1,301,054.80. Contract awarded to Edward Keeble, San Jose, $585,164.50.

TEHAMA COUNTY—Between 1.4 miles east of junction with Route 3 and Ellenwood Creek about 7.0 miles in length to be surfaced with plant-mixed surfacing on cement treated base. District II, Route 29, Section A. Clements Construction Co., & Clements & Co., Hayward, $182,845; M. J. Ruddy & Son, Modesto, $182,929; Harms Bros., Sacramento, $190,304.50; Ransome Co., Emeryville, $203,090; Granite Construction Co., Watsonville, $208,480; Claude C. Wood Co., Lodi, $210,077.50; Peter Kiewit Son's Co., San Francisco, $221,015. Contract awarded to Fredrickson & Watson Construction Co., Oakland, $158,091.20.

TULARE COUNTY—At the Visalia Airport Interchange, about 3.2 miles of roadway to be graded, portions surfaced with plant-mixed surfacing on untreated rock base and three steel beam bridges to be constructed. District VI, Route 4, 10, Sections, F; A,B. Guy F. Atkinson Co., South San Francisco, $636,899.30; Trewhitt-Shields & Fisher, Fresno, $641,055.55; Gordon Ball & San Ramon Valley Land Co., Berkeley, $649,674.14; Fredrickson & Watson Construction Co., Oakland, $656,-186.10; Charles MacClosky Co., Clyde W. Wood & Sons, Inc., Los Angeles, $723,815.65. Contract awarded to Fredrickson & Kasler, Sacramento, $593,-954.80.

YOLO COUNTY—Between 9.3 miles south of Rumsey and 7.8 miles west of Esparto, bridges are to be widened and constructed, and approaches are to be graded and surfaced with plant-mixed surfacing on untreated rock base. District III, Route 50, Sections B,C. Stanley H. Koller Construction, Crockett, $107,271.75; A. A. Edmondson, Butte City, $116,790.69; R. G. Clifford & C. O. Bodenhamer, Berkeley, $117,566.35. Contract awarded to W. C. Railing, Woodland, $102,508.10.

F. A. S. County Routes

DEL NORTE COUNTY—On Elk Valley Road near Crescent City between State Route 1 and Howland Hill Road, about 1.1 mile in length to be graded, imported base material placed and Class "B-Double" seal coat. District I, Route 1190. J. Henry Harris, Berkeley, $58,927. Contract awarded to John Burman & Sons, Eureka, $50,521.

HUMBOLDT COUNTY—On Bull Creek-Honey Dew Road between 7.3 miles and 10.1 miles westerly of Bull Creek Flat State Park, about 2.9 miles in length, road to be graded. District I, Route 976. Huntington Bros., Napa, $59,825; J. L. Conner, Jr., Eureka, $65,504; Vega Engineering & Grading Co., Berkeley, $105,940. Contract awarded to John Burman & Sons, Eureka, $53,710.

MARIN COUNTY—Portions between Fairfax and Tocaloma about 1.1 miles in net length to be graded and surfaced with plant-mixed surfacing. District IV, Route 608. Brown-Ely Co., Contractors, Corte Madera, $150,287.50; J. Henry Harris, Berkeley, $154,024. Contract awarded to A. G. Raisch Co., San Rafael, $144,866.60

SAN LUIS OBISPO COUNTY—On Los Osos Road between Perfumo Canyon Road and 2.2 miles west, about 2.2 miles in length, to be graded and surfaced with plant-mixed surfacing on cement treated imported base material. District V, Route 678. Valley Paving Co., Pismo Beach, $106,082; Granite Construction Co., Watsonville, $108,938.25; Thomas Construction Co., Fresno, $112,219.50; Dimmitt & Taylor, Monrovia, $119,301.35; Clyde W. Wood & Sons, Inc., North Hollywood, $121,757.50; J. Henry Harris, Berkeley, $141,191.50. Contract awarded to Madonna Construction Co., San Luis Obispo, $97,852.50.

SOLANO COUNTY—Between Travis Air Force Base Access Road and Vacaville about five miles in length, to be graded and surfaced with plant-mixed surfacing on untreated rock base. District X, Route 1107. Parish Bros. & Harms Bros., Benicia, $241,-747.30; Browne & Krull, Hayward, $259,319.50; Nomellini Construction Co., Stockton, $264,991.20. Contract awarded to Frederickson Bros., Emeryville, $241,496.70.

SONOMA COUNTY—Across Sonoma Creek on Caliente Drive, about five miles north of Sonoma, a structural steel and reinforced concrete bridge to be constructed. District IV, Route 1189. S & Q Construction Co. & Rayor Construction Co., San Francisco, $51,923.20; Stolte Inc., Oakland, $52,453.80; Robert R. Murdoch, Oakland, $53,133; Payne Construction Co., Oakland, $54,249; Stanley H. Koller Construction, Crockett, $54,290.50; W. J. Kubon, San Rafael, $54,829.30; James H. McFarland, San Francisco, $54,882; Al Erickson & Co., Napa, $55,-130.50; R. G. Clifford & C. O. Bodenhamer, Berkeley, $56,907.70; Bos Construction Co., Berkeley, $62,081.90; Wheeler Construction Co., Oakland, $64,800. Contract awarded to Barton Construction Co. & B & B Steel Erectors, Oakland, $51,178.60.

STANISLAUS COUNTY—On Grayson Road between Crows Landing Road and Jennings Road, about 4.0 miles in length to be surfaced with plant-mixed surfacing on untreated rock base and existing surfacing. District X, Route 1194. Stephens Trucking Co., French Camp, $68,500; Munn & Perkins, Modesto, $74,040; M. J. Ruddy & Son, Modesto, $79,395; Stanfield & Moody, Stockton, $81,958; Wm. S. & Bruce F. Rogers Co., Madera, $85,905. Contract awarded to Ukropina-Polich-Kral, San Gabriel, $64,603.

September, 1953

ALAMEDA AND CONTRA COSTA COUNTIES—In the cities of Albany and Richmond, at Cerrito Creek, two reinforced concrete box structures to be constructed. District IV, Route 69. O. C. Jones & Sons, Berkeley, $53,219; Stanley H. Koller Construction, Crockett, $55,760; McGuire & Hester, Oakland, $58,268; Wheeler Construction Co., Oakland, $60,116; J. Henry Harris, Berkeley, $69.471; Lee J. Immel, San Pablo, $73,918. Contract awarded to Morison Construction Co. & Ted Schwartz, Grass Valley, $48,849.

ALAMEDA COUNTY—On East 14th Street between 173d Avenue and Medford Avenue, traffic signal system and channelization to be constructed. District IV, Route 105, Section B. O. C. Jones & Sons, Berkeley, $30,601; Fredrickson Bros., Emeryville, $31,968; J. Henry Harris, Berkeley, $33,400. Contract awarded to Clements Construction Co., Hayward, $30,475.

CONTRA COSTA COUNTY—Between 0.5 mile west and 0.7 mile east of Orinda Junction, about 1.2 miles, to be graded and paved with Portland cement concrete pavement on cement treated subgrade and a reinforced concrete box girder bridge to be constructed. District IV, Route 75, Section A. Dan Caputo & Edward Keeble, San Jose, $1,527,357; Stolte, Inc.-Gallagher & Burk, Inc., Oakland, $1,-588,278; Ball & Simpson & Erickson, Phillips & Weisberg, Berkeley, $1,712,492; Parish Bros. & MacDonald, Yound & Nelson, Inc., Benicia, $1,730,-355; Chas. L. Harney, Inc., San Francisco, $1,833,-897; Ukropina, Polich, Kral & John R. Ukropina, San Gabriel, $1,854.536; John Delphia, Patterson, $1,934,432; Guy F. Atkinson Co., South San Francisco, $1,963,631. Contract awarded to Fredrickson & Watson Construction Co., M & K Corp., Oakland, $1,451,980.

INYO COUNTY—Between 3.9 and 6.1 miles east of Stovepipe Wells, about 2.2 miles, the existing roadway to be reconstructed with bituminous surface treatment on imported base material. District IX, Route 127, Section I. Bishop Engineering & Construction Co., Bishop, $25,438; Clyde W. Wood & Sons, Inc., North Hollywood, $26,149; Browne & Krull, Hayward, $31,040; Norman I. Fadel, North Hollywood, $33.887; Wm. S. & Bruce F. Rogers Co., Madera, $34,060; F. W. Case Corp., Newhall, $35,534; G. W. Ellis Construction Co., North Hollywood, $37,290; Gardner Construction Co., Redlands, $37,862; Chas. J. Rounds Co., Los Angeles, $38,503. Contract awarded to James E. Roberts, San Bernardino, $21,868.

LOS ANGELES COUNTY—At the intersection of Atlantic Blvd. with Washington Blvd. and Pioneer Blvd. with Alondra Blvd., traffic signal system and highway lighting to be furnished and installed and modified. District VII, Routes 167, 170, Sections A, A. C. D. Draucker, Inc., Los Angeles, $23,560; Drury Electric Co., San Bernardino, $23,888; Westates Electrical Construction Co., Los Angeles, $24,709; Electric & Machinery Service, Inc., South Gate, $25,036. Contract awarded to Fischbach and Moore, Inc., Los Angeles, $21,440.

LOS ANGELES COUNTY—At the intersections of Lakewood Blvd. with Center Street, Compton Blvd., Rosecrans Avenue and Gardendale Street,

traffic signal systems and highway lighting to be modified. District VIII, Route 168, Section A. Fischbach & Moore, Inc., Los Angeles, $28,715; Electric & Machinery Service, Inc., South Gate, $29,098. Contract awarded to Westates Electrical Construction Co., Los Angeles, $27,769.

MARIN COUNTY—Between Manzanita and Golden Gate Bridge, about 4 miles to be graded and a concrete lined vehicular tunnel and miscellaneous reinforced concrete structures to be constructed. District IV, Route 1, Sections C, D, Saus. Chas. L. Harney, Inc., San Francisco, $4,442,415; McCammon-Wunderlich Co., T. E. Connolly, Inc., & Charles MacClosky Co., San Francisco, $4,711,490; Fredrickson & Watson Construction Co. & M. & K Corp., Oakland, $4,977,735; A. Teichert & Son, Inc., & John C. Gist, Sacramento, $5,211,512; Macco Corp., Morrison-Knudsen Co., Inc., & River Construction Corp., Los Angeles, $52,262,738; Walsh Construction Co. & Eaton & Smith, San Francisco, $5,517,612; Utah, Bates-Rogers, Pomeroy, San Francisco, $6,207,417. Contract awarded to Guy F. Atkinson Co., South San Francisco, $4,122,382.

MONO COUNTY—Applying seal coat on portions between Conway Summit and Sonora Junction Road. District IX, Route 23, Sections I, J. G. W. Ellis Construction Co., North Hollywood, $8,060. Contract awarded to Oilfields Trucking Co., Bakersfield, $5,330.

ORANGE COUNTY—On Imperial Highway, about 0.3 mile east of east city limits of Brea, existing culvert to be replaced. District VII, Route 176, Section A. R. E. Crane, Bellflower, $4,425; E. S. & N. S. Johnson, Fullerton, $4,751; Albert S. Pratt, Jr., Pasadena, $6,764; N. M. Saliba Co., Los Angeles, $9,185. Contract awarded to A. H. Famularo, Santa Ana, $3,970.

SAN BERNARDINO COUNTY—At the intersection of Foothill Boulevard with Archibald Avenue and in the City of Ontario at the intersection of Mission Boulevard with Euclid Avenue, traffic signal systems and highway lighting to be furnished and installed and modified and channelization to be constructed. District VIII, Routes 9, 19, 192. Paul R. Gardner, Ontario, $52,076; Electric and Machinery Service, Inc., South Gate, $52,595; Fischbach and Moore, Inc., Los Angeles, $56,646. Contract awarded to Drury Electric Co., San Bernardino, $51,867.

SAN BERNARDINO COUNTY—Between Baker and one-half mile east of Valley Wells, 10 timber trestle bridges to be redecked with reinforced concrete slabs. District VIII, Route 31, Sections L, M. C. B. Tuttle, Long Beach, $53,664; Norman I. Fadel, North Hollywood, $55,782; Young & Smith Construction Co., Salt Lake City, $56,772; Dimmitt & Taylor, Monrovia, $57,849; E. S. & N. S. Johnson, Fullerton, $58,080; Concrete Construction Service, Inc., Gardena, $59,591; F. W. Case Corp., Newhall, $59,682; J. L. McCay, Santa Barbara, $64,351; Thomas Construction Co., Fresno, $67,329; Ruane Corp., San Gabriel, $69,670. Contract awarded to Fred O. Kyle, Pasadena, $44,079.

SAN BERNARDINO COUNTY—Between Barstow and Essex, 39 timber bridges to be redecked with reinforced concrete slabs. District VIII, Route 58, Sections F, J, K, L. Concrete Construction Service, Inc., Gardena, $146,568; Fred D. Kyle, Pasadena, $147,484; C. B. Tuttle, Long Beach, $159,044; F. W. Case Corp., Newhall, $160,048; Dimmitt & Taylor, Monrovia, $167,815; Ruane Corp., San Gabriel, $171,757; Sooy & Jackson & Marks Bros. Construction Co., Redlands, $171,777; E. S. & N. S. Johnson, Fullerton, $174,346; George Herz & Co., San Bernardino, $177,382; Jesse S. Smith and Service Construction Co. of Southern California, Sun Valley, $181,444; Chaney Construction Co., Los Angeles, $184,793; Tumblin Co., Bakersfield, $185,880; Norman I. Fadel, North Hollywood, $189,040; Young & Smith Construction Co., Salt Lake City, $205,076; Thomas Construction Co., Fresno, $210,610. Contract awarded to John Strona, Pomona, $136,914.

SAN DIEGO COUNTY—At Basilone Road, about 3 miles south of San Clemente, about 0.4 mile to be graded, plant-mixed surfacing to be placed on cement treated base, and a structural steel and reinforced concrete bridge to he constructed. District XI, Route 2, Section D. Clifford C. Bong & Co., Arcadia, $185,405; Dimmitt & Taylor, Monrovia, $186,971; Cox Bros. Construction Co., Stanton, $190,977; E. F. Grandy, Laguna Beach, $196,546; Owl Truck & Construction Co., Compton, $215,780; James E. Roberts, San Bernardino, $229,680; Griffith Company, Los Angeles, $229,827; George Herz & Co., San Bernardino, $236,637. Contract awarded to Webb & White, Los Angeles, $184,038.

SAN JOAQUIN COUNTY—At the intersection of Route 4 with Mariposa Road, Fremont Street, and Waterloo Road, near Stockton, traffic signal system and highway lighting to be revised and channelization to he constructed. District XV, Route 4, Sections E. C. R. Goold & Son, Stockton, $23,234. Contract awarded to Collins Electric Co., Inc., Stockton, $22,222.

SAN MATEO COUNTY—Between 0.1 mile north of Country Club Drive and Roosevelt Avenue in the City of South San Francisco, about 0.3 mile in length to be graded and surfaced with plant mixed surfacing on cement treated base. District IV, Route 2, Section SSF, A. The Lowrie Paving Co., Inc., San Francisco, $52,699; Chas. L. Harney, Inc., San Francisco, $62,396; J. Henry Harris, Berkeley, $71,733. Contract awarded to L. C. Smith Co., San Mateo, $52,440.

SAN MATEO COUNTY—Between Correas Street and Montara Creek (portions) about 5.9 miles in net length, plant-mixed surfacing to be placed over existing pavement. District IV, Route 56, Sections C, D. L. C. Smith Co., San Mateo, $29,912; The Fay Improvement Co., San Francisco, $34,490; J. Henry Harris, Berkeley, $35,474. Contract awarded to Douglas & Woodhouse, Redwood City, $28,492.

SANTA CLARA COUNTY—In the City of Alviso, between south city limits and 0.3 mile north, about 0.3 mile in length to he surfaced with plant-mixed surfacing on cement treated base. District IV, Route 113. Granite Construction Co., Watsonville, $20,583; Clements Construction Co., Hayward, $22,297; S. A. E. Co., Redwood City, $23,356; L. C. Smith Co., San Mateo, $23,650; John A. Carstensen, Castro Valley, $23,847; J. Henry Harris, Berkeley, $24,645; A. J. Raisch Paving Co., San Jose, $26,698; Leo F. Piazza Paving Co., San Jose, $28,366. Contract awarded to Donald Graves, San Jose, $19,256.

SANTA CLARA COUNTY—On Mathilda Avenue between Southern Pacific Railroad crossing and Bayshore Highway about 1.3 miles in length to be surfaced with plant-mixed surfacing. District IV, Route 114, Sections Sunv, A. A. J. Raisch Paving Co., San Jose, $20,937; Granite Construction Co., Watsonville, $24,022; L. C. Smith Co., San Mateo, $23,980; George C. Renz Construction Co., Inc., Gilroy, $26,278; Leo F. Piazza Paving Co., San Jose, $26,724; John A. Carstensen, Castro Valley, $26,821; J. Henry Harris, Berkeley, $31,865. Contract awarded to S. A. E. Co., Redwood City, $20,325.

SONOMA COUNTY—At the intersection of Redwood Highway and Gravenstein Highway near Cotati, highway lighting to be modified and channelization to be constructed. District IV, Route 1, 104, Sections C, C. Arthur B. Siri, Inc., Santa Rosa, $16,990; A. G. Raisch Co., San Rafael, $17,923; O. C. Jones & Sons, Berkeley, $18,288; J. Henry Harris, Berkeley, $19,529. Contract awarded to I. J. Ely Co., Larkspur, $16,738.

SONOMA COUNTY—At Stockoff Creek, about 4.5 miles north of Fort Ross, a reinforced concrete box structure to be constructed. District IV, Route 56, Section D. Nomellini Construction Co., Stockton, $22,613; R. G. Clifford & C. O. Bodenhamer, Berkeley, $22,732; Morison Construction Co. & Ted Schwartz, Grass Valley, $23,434; Wheeler Construction Co., Oakland, $35,016. Contract awarded to James H. McFarland, San Francisco, $21,940.

SONOMA COUNTY—Reconstruct shoulders and drainage between 0.4 mile north of Alexander Valley Store and 2.9 miles north of Maacama Creek. District IV, Route 103, Section A. O. C. Jones & Sons, Berkeley, $15,272; J. Henry Harris, Berkeley, $20,012. Contract awarded to Arthur B. Siri, Inc., Santa Rosa, $14,805.

SAN MATEO COUNTY—Across San Francisco Bay between San Mateo and Hayward, the lift span counterweight ropes of the existing bridge to be replaced and inspection platforms to be constructed. District IV, Route 105, Section B. Moore Drydock Co., Oakland, $50,685; Judson Pacific-Murphy Corp., Emeryville, $55,014; Herrick Iron Works, Oakland, $64,760; William B. Willett Co., Sacramento, $66,555; J. R. Cantrall Co., El Monte, $66,907; Hart & Hynding Co., San Francisco, $67,653; Kyle Steel Construction Co., Vernon, $73,812; James H. McFarland, San Francisco, $89,898; American Bridge Division U. S. Steel Corp., San Francisco, $92,500. Contract awarded to Payne Construction Co., Oakland, $50,641.

TEHAMA COUNTY—Between Hickory Street in Red Bluff and 0.8 mile northerly, about 0.8 mile in length to be surfaced with plant-mixed surfacing on cement treated base. District II, Route 3, Sections RB1, C. Contract awarded to Fredrickson & Watson Construction Co., Oakland, $47,290.

F. A. S. County Routes

EL DORADO COUNTY—Between Webber Creek Bridge and U. S. Highway 50 in Shingle Springs, a net length of about 5.5 miles to be graded and drainage facilities installed. District III, Route 1187. John G. Mehren, Sacramento, $105,666; Joe Vicini, Placerville, $107,959; M. Malfitano & Son, Inc., Pittsburg, $112,519; W. H. O'Hair Co., Colusa, $112,941; Claude L. Young, Sacramento, $116,957; Karl C. Harmeling, Stockton, $120,510; W. H. Darrough & Son, Yuba City, $123,660; S. A. E. Co., Redwood City, $129,198; M. W. Brown, Redding, $129,550; Harms Bros., Sacramento, $147,197; Ted Schwartz, Grass Valley, $179,616. Contract awarded to Hunting Bros., Napa, $99,999.

MERCED COUNTY—On Santa Fe Drive between Cressey and Buhach Road about 5.9 miles in length, to be graded and surfaced with plant-mixed surfacing. District X, Route 912. Nomellini Construction Co., Stockton, $89,270; M. J. Ruddy & Son, Modesto, $89,521; Thomas Construction Co., Fresno, $92,990; Granite Construction Co., Watsonville, $95,681; Standard Materials, Inc., Modesto, $97,507; W. H. O'Hair Co., Colusa, $99,671; Claude C. Wood Co., Lodi, $100,364; Harms Bros., Sacramento, $107,396; Karl C. Harmeling, Stockton, $117,656; L. D. Folsom, Inc., Coalinga, $149,577. Contract awarded to Stephens Trucking Co., French Camp, $87,089.

SANTA CLARA COUNTY—On Grant Road between Fremont Avenue and El Camino Real about 2 miles in length to be graded and surfaced with plant-mixed surfacing on untreated rock base. District IV, Route 999. A. J. Raisch Paving Co., San Jose, $111,711; S. A. E. Co., Redwood City, $115,049; Granite Construction Co., Watsonville, $115,162; L. C. Smith Co., San Mateo, $115,759; Don Graves Paving, San Jose, $119,157; J. Henry Harris, Berkeley, $178,210. Contract awarded to Leo F. Piazza Paving Co., San Jose, $108,383.

SANTA CRUZ COUNTY—On Bear Creek Road at junction with State Highway Route 116 near Boulder Creek, a steel and concrete bridge to be constructed across San Lorenzo River and about 0.07 mile of approaches to be graded and surfaced with untreated rock base and seal coat. District IV, Route 1172. James H. McFarland, San Francisco, $57,436; Granite Construction Co., Watsonville, $58,620; S & Q Construction Co., and Rayor Construction Co., Inc., South San Francisco, $61,149; Dan Caputo, San Jose, $61,268; Charles S. Moore, San Jose, $61,535; A. A. Edmondson, La Crescenta, $62,149; Geo. C. Renz Construction Co., Inc., Gilroy, $62,376; Stanley H. Koller Construction, Crockett, $64,465; Payne Construction Co., Oakland, $64,899; Lew Jones Construction Co., San Jose, $64,986; E. G. Perham, Los Angeles, $66,934; Al Erickson & Co., Napa, $67,203; Bos Construction Co., Berkeley, $67,446; Friant Construction Co., Fresno, $68,250; Condick Co., Berkeley, $76,421; Wheeler Construction Co., Oakland, $77,991. Contract awarded to Stolte, Inc., Oakland, $56,835.

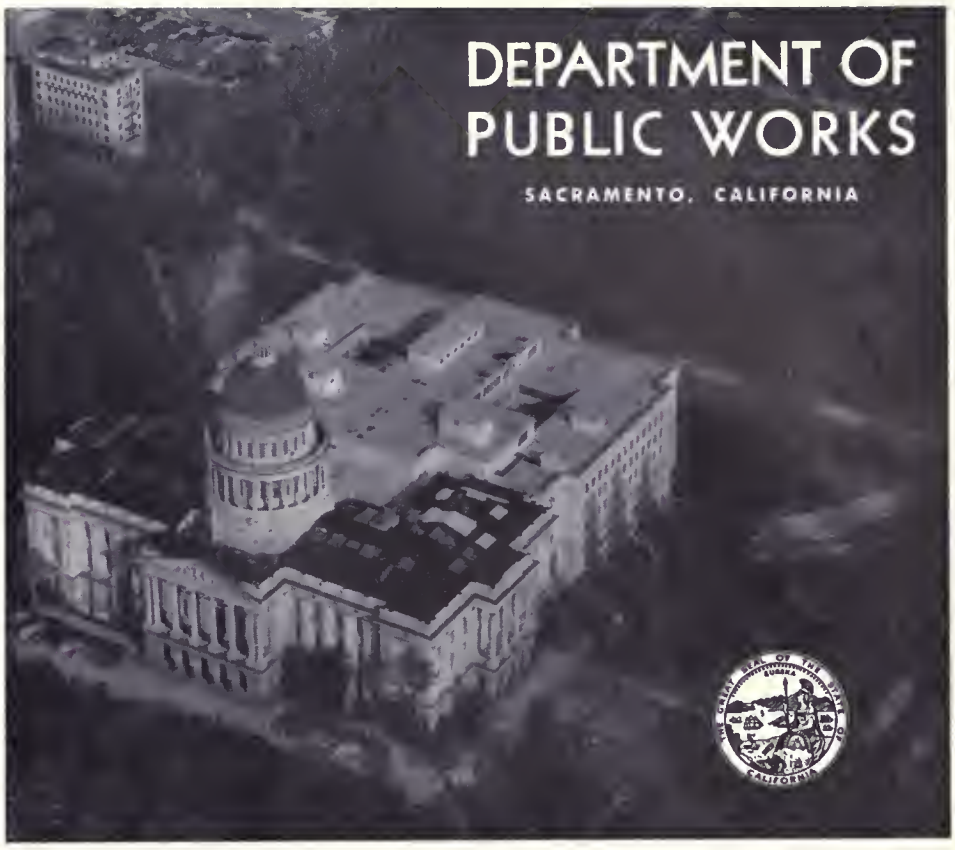
TULARE COUNTY—On Alta Avenue between F. A. S. Route 1141 and Tulare-Fresno County Line near the City of Dinuba, about 5.0 miles in net length, improved base material to be placed and plant-mixed surfacing to be placed on cement treated base. District VI, Route 579. Baun Construction Co., Fresno, $159,274; M. J. Ruddy & Son, Modesto, $160,260; G. W. Ellis Construction Co., North Hollywood, $168,355; Clements & Co., Hayward, $170,810; Claude C. Wood Co., Lodi, $175,774; Valley Paving Co., Pismo Beach, $177,832; Stewart & Nuss, Inc., Fresno, $184,732; R. R. Hensler, Sun Valley, $186,003; A. Teichert & Son, Inc., Sacramento, $187,504; Fredericksen and Kasler, Sacramento, $241,159. Contract awarded to Gene Richards, Inc., Fresno, $138,179.

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San Quentin Wye separation located 0.4 mile south of San Rafael in Marin County
Photo by Louis C. Dudley, Department of Public Works



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HIGHWAYS AND PUBLIC WORKS



NOVEMBER - DECEMBER
1953

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KENNETH C. ADAMS, *Editor*
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Public Works Building
Twelfth and N Streets
Sacramento

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To the Employees of the Department of Public Works:

This glorious Yule season is a time when we may well pause to review the past year and express through the message of Christmas our thanks and appreciation for the good things we have enjoyed, and the friends and associates with whom we have been privileged to plan and work.

As we look back upon the past year, one of the most gratifying "good things" we have experienced is the wonderful cooperation and excellent performance in the public service of each of the divisions of the Department of Public Works.

The success of any department of government is, in reality, to be found in the attitude, the devotion and the efficiency of its employee-members. I wish to take this opportunity to express my gratitude to each of you for your individual contributions in this regard.

May the accomplishments of the past year give you all continuing satisfaction, and the challenge of a new year bring you inspiration to resolve that it may be even more productive in the fruits of your labor, in the enjoyment of your friendships, and in the happiness of your families.

A MERRY, MERRY CHRISTMAS

Frank B. Durkee

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First Snowfall of Season Comes to Echo Summit on US 50. Photo Taken on Meyer's Grade by Robert A. Munroe, Photographic Section, Department of Public Works, M. R. Nickerson, Chief ..... Cover

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New Bay Crossing

Story of the Richmond-San Rafael Bridge

By NORMAN C. RAAB, Projects Engineer, Division of San Francisco Bay Toll Crossings

In 1915 an automobile and passenger ferry service was inaugurated between Castro Point in Contra Costa County and Point San Quentin in Marin County. The venture was successful from the start, and in 1952 more than 1,000,000 vehicles were transported across the bay.

Since the early 1920's proposals to replace the ferry with a bridge have interested and intrigued many people. In 1926 R. L. Vaughn made an engineering study and reported that such a bridge was entirely feasible and would be a sound financial undertaking. The American Toll Bridge Company, builder of the Carquinez and Antioch Bridges, made a study in 1928. This company obtained a permit from the War Department and a franchise from the County of Contra Costa. Another proposal was made in 1928 by T. A. Tomasini. His crossing was to be between Alameda County and Marin County, and the principal feature was a long subaqueous tube under the navigable channels.

State Becomes Interested

In 1949 the County of Marin and the City of Richmond combined efforts and finances to have a preliminary engineering report made by the firm of Earl and Wright of San Francisco. This report was favorable and expressed the opinion that the project could be accomplished. Marin County and the City of Richmond then succeeded in getting an appropriation from the State Legislature in the 1950 Session for $200,000 for further studies by the Department of Public Works with instructions to the effect that it be ascertained if a vehicular crossing could be built in accordance with the provisions of the California Toll Bridge Authority Act. The Director of Public Works assigned this investigation to the Division of San Francisco Bay Toll Crossings.

Legislative Appropriation

In January, 1951, a report to the State Legislature determined that a toll bridge could be constructed and financed under the provisions of the act and an additional sum of $750,000 was made available to the Department of Public Works to prepare detailed plans and specifications. Out of these funds an amount of $767,000 was spent and this amount has subsequently been paid back to the State Treasury from the sale of bonds. On August 8, 1951, the Chief of Engineers and the Secretary of the Army approved the location and the preliminary plans for the construction of the bridge. On November 27, 1951, the State approved the preliminary report and determined that the Richmond-San Rafael Bridge should be constructed and operated by the State of California under the provisions of the Toll Bridge Act.

The California Toll Bridge Authority, on November 7, 1952, authorized the creation of an issue of not to exceed $72,000,000 Richmond-San Rafael Bridge Toll Bridge Revenue Bonds and sold, on February 26, 1953, $62,000,000 Series A Bonds for the



RICHMOND — SAN RAFAEL BRIDGE

initial construction of the bridge with the upper deck only. The bonds of Series B, $10,000,000, are to provide funds for one or more of the following purposes:

(a) To finance the completion of the bridge.

(b) To finance the construction of the lower level, improvements to approaches and additional approach roadways, and additional toll collection facilities.

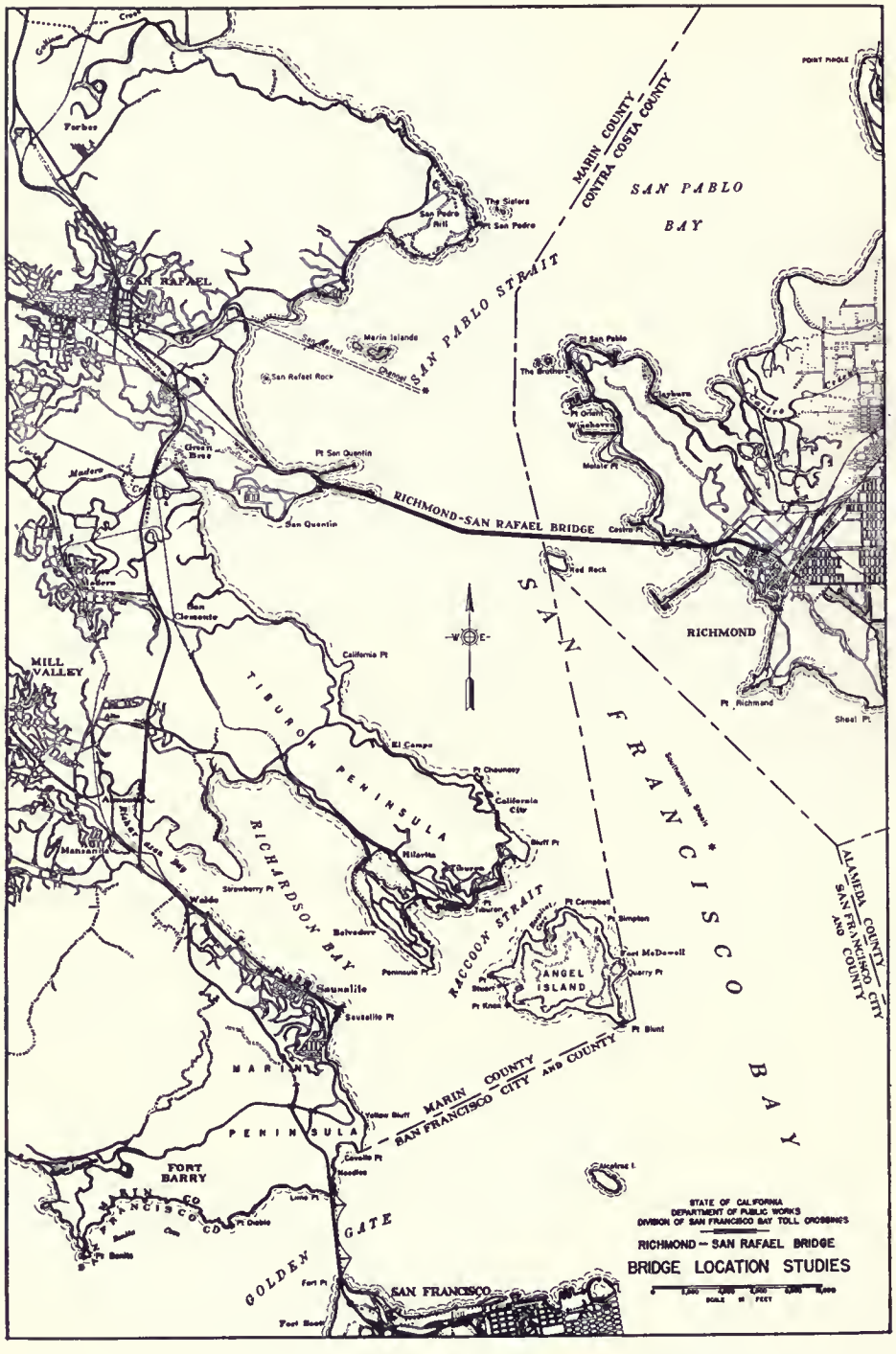
Location and Description of the Bridge

The bridge will provide a new crossing facility over San Francisco Bay, directly connecting the County of Marin at San Quentin and the County of Contra Costa at Richmond. It will form an important link in the existing public highway system, connecting U. S. Route 40, the San Francisco-Oakland Bay Bridge, and other important state highways on the east side of San Francisco Bay with U. S. Route 101 and the north coastal counties on the west side of the bay. In general, the bridge will follow substantially the same route as that now traveled by the Richmond-San Rafael Ferries. In addition to the seven different routes studied, preliminary consideration was also given to an earth and rock fill type of construction across the bay. However, it was ascertained that the cost of such work, including appurtenant facilities such as navigation locks and lift spans would be far beyond any possibility of financing by means available to the California Toll Bridge Authority.

Six-lane Bridge

In order that the bridge may serve a traffic capacity sufficient to meet estimated growth in traffic volume for a number of years, it is planned that the bridge will, upon its final completion, be a double-decked structure with three 12-foot westbound traffic lanes on the upper deck and three 12-foot eastbound lanes on the lower deck.

The peak of traffic by ferry has been slightly over 1,000,000 vehicles per year. It is estimated that during the first full year of operation of the bridge, in 1957, there will be 3,900,000 crossings; 10 years later 5,800,000, and by 1980 at least 8,200,000 vehicles will be served by the bridge in one year.



The over-water crossing of the bridge will be 4.0 miles in length; however, the total length of the project, including approaches on each end, will be 5.5 miles. Commencing at Point San Quentin in Marin County, the bridge will consist of 2,800 feet of trestle approach, which in turn will connect to 1,900 feet of 100-foot girder spans. The girder spans will be connected to the cantilever structure over the main navigation channel by 4,100 feet of 292-foot truss spans. The span of this cantilever structure will be 1,070 feet center to center of the piers with anchor arms of 537 feet. Between this structure and the cantilever structure, over the secondary navigation channel, there will be 3,000 feet of additional truss spans. From this location into Castro Point in Rich-



Pile driving and dredging operations as seen from Contra Costa County shore

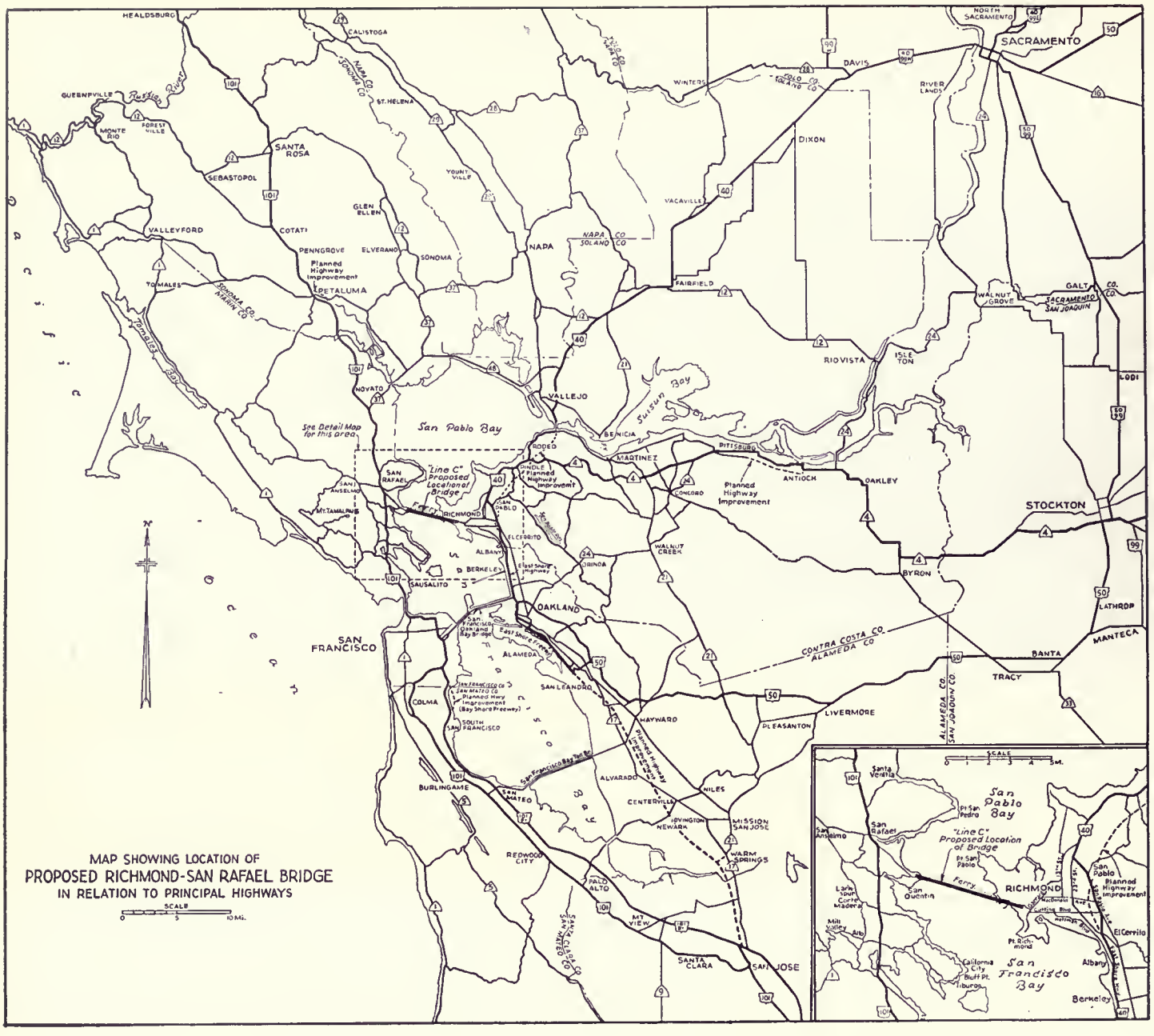
mond there will be 3,500 feet of truss and 1,700 feet of girder spans terminating the over-water structure on an earth fill which will be constructed near Castro Point and upon which will be located the toll plaza and toll collecting facilities, as well as administration and maintenance buildings.

Two Cantilever Structures

The two cantilever structures will provide horizontal clearances of 1,000 feet, with a vertical clearance of 185

Mole fill showing mud wave





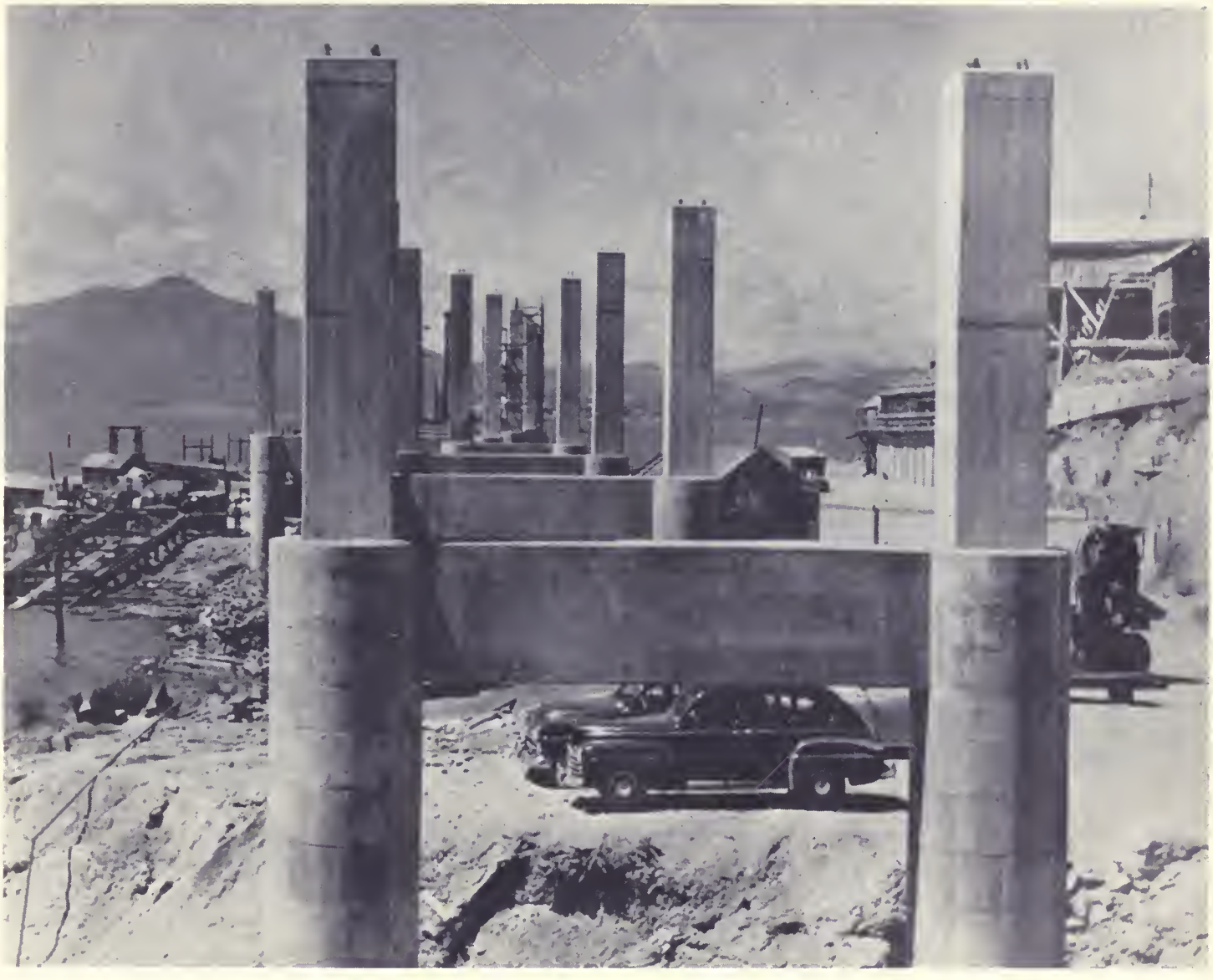
feet over the main navigation channel and 135 feet over the secondary channel. The bridge, as well as the approaches thereto, will be built on freeway standards and will afford the only route in the area with grades of 3 percent or less, conducive to truck traffic. A grade separation connecting the Marin bridge approach with U. S. Highway 101 has been completed at the San Quentin Wye. On the east side a new section of freeway will be built connecting the Toll Plaza of the Bridge with State Route 69 in Richmond. Grade separation structures will be provided for the orderly disposal of traffic by way of City of Richmond streets.

Competition

The bridge would have been faced with direct competition with the privately owned Richmond-San Rafael Ferry, but an agreement was entered into with the ferry company whereby the State has purchased certain lands and facilities useful in the construction and operation of the bridge and the ferry will discontinue operation upon the opening of the bridge to public traffic. The bridge will compete, as to certain traffic, with the existing Golden Gate Bridge, San Francisco-Oakland Bay Bridge, and Carquinez Bridge. Potential traffic on the new span necessarily includes traffic to be diverted from each of these existing structures.

Construction

The Department of Public Works, under the direction of the authority, called for bids for the construction of the substructure and superstructure of the bridge which were opened on December 19, 1952. The low bid on



Completed dry land piers for Richmond approach

the substructure was $14,234,550 and was awarded to Ben C. Gerwick, Inc., and Peter Kiewit Sons' Co., a joint venture. On the superstructure the low bid was $21,099,319 and was awarded to Peter Kiewit Sons' Co., A. Soda & Son, and Judson Pacific-Murphy Corp., another joint venture. The bids were well within the engineer's estimates of cost. These contracts comprise approximately 80 percent of the construction cost of the project.

Two Cantracts Awarded

Two contracts have subsequently been awarded; one for a mole fill on which will be located the toll plaza, administration and maintenance buildings on the Richmond end of the project, and the other for a short piece of trestle connecting the present ferry pier with the bridge. This piece of trestle is to be used in the initial stage of construction. The fill contract was awarded to Parish Bros., who submitted a low bid of $268,787, and the trestle contract to Payne Construction Co. for an amount of $176,730.

There are other contracts which are to be let at proper times during the various stages of construction of the above work, and which include electrical work, buildings, approaches and pavement thereon. The time of construction estimated by the Department of Public Works is 3½ years and it is now contemplated that the bridge will be open to public traffic by October of 1956.

Maintenance and Operation

The cost of maintaining and operating the bridge will be paid out of revenues from tolls. Operation by the State will be through an agency similar to and in conjunction with the San Francisco-Oakland Bay Bridge. Total annual maintenance and operation costs are estimated at $500,000, which includes painting, toll collecting, insurance, and other miscellaneous expenses.



General view of Richmond approach to bridge

Tolls

Tolls sufficient to provide for (a) cost of maintaining and operating the bridge, (b) to meet interest payment on the bonds as they come due, (c) to provide a sinking fund for bonds as they fall due, and (d) to provide a reserve fund for outstanding bonds will be charged. The proposed schedule for the Richmond-San Rafael span at opening is 75 cents for a passenger car, with a commutation rate good for 60 days with 60 rides for $22.50 or an average of 37½ cents per trip. Trucks will be charged an axle basis, starting at $1.25 for a two-axle truck up to $4 for a seven-axle truck. Assuming that experience on this bridge will be similar to that experienced on other bridges crossing San Francisco Bay, the above figures should prove to be very conservative and the volume of business developed after opening should make it possible to either gradually reduce tolls or retire the indebtedness earlier than originally anticipated.

Toll Collection Facilities

Since it is contemplated that the supervision of the bridge will be performed by the staff of the San Francisco-Oakland Bay Bridge, and since the eastern end of the bridge is more readily accessible to the Bay Bridge, this end has been selected for the location of the toll collection facilities. The principal features of the toll plaza are that all collections will be made on the driver's side of the vehicle, and that the Administration Building will be in the center of the plaza with unidirectional traffic flowing on either side. In addition to the Administration Building, it is planned to provide a small maintenance building on both sides of the bay.

Financing

The Toll Bridge Authority, at public sale on December 29, 1952, awarded the initial series of $62,000,000 bonds to a nation-wide syndicate headed by Blyth & Co., Inc., The First Boston Corporation, Harriman, Ripley & Co., Incorporated, and Lohman Brothers. The Crocker First National Bank of San Francisco was designated as fiscal agent. The bonds are dated September 1, 1952, and will bear interest at 3⅞ percent per annum, running to September 1, 1992. The bonds are redeemable prior to maturity at the option of the Toll Bridge Authority under a schedule of premiums adopted when this callable feature was included. The only security behind the bonds are the tolls to be collected from the users of the bridge. The project is entirely self-supporting, free of any liability or obligation from any tax source.

The funds provided by this issue will finance the construction of the bridge, including repayment to the State Highway Fund of funds appropriated by the State Legislature and used for the preparation of surveys, plans, cost estimates and specifications, and for other expenses incident to the

. . . Continued on poge 64

Ridgewood Project

Challenges Engineers of Division of Highways

By E. L. BLOMQUIST, District Construction Engineer

Construction is now under way to replace that section of the Redwood Highway known as Ridgewood Grade. The project is roughly situated midway between Ukiah and Willits and is 4.1 miles in length.

To those familiar with the present highway traversing the Ridgewood Grade, its reconstruction to modern standards was a challenge to design, soils, and construction engineers. This long awaited and eagerly anticipated event, now imperative because of traffic requirements, put to the crucial test their knowledge of highway engineering as well as their ingenuity in developing ways and means of obtaining a stable roadway.

Unstable Terrain

It was appreciated that subsurface drainage, fill and cut stabilization would involve an expenditure of funds which would have financed the construction of several miles of a 1930 standard highway, while on the planned project it would be an unnoticed expenditure to the layman only justified by a reasonably stable highway through terrain probably as unstable as any similar conditions encountered by highway engineers.

The section of highway to be reconstructed was graded in 1914-15 to horse-and-buggy standards and, except for surfacing, has been improved but little since that time. The present alignment is tortuous, contouring the westerly slope of broken mountainous terrain. Sight distance is very limited, allowing few opportunities for passing slow-moving trucks and house trailers which negotiate the uphill grade at speeds quite aggravating to passenger car traffic. This combination of factors results in the formation of long traffic queues with all traffic reduced to the speed of the leading vehicle. Needless to say, traveling this section of road during the summer months when tourist traffic is heavy is very frustrating to the average motorist.

To Be Four-lane Expressway

The need for reconstructing this section of highway was recognized 10 years ago with the adoption of the District Postwar Construction Program by the Highway Commission on November 18, 1943. Project No. 4 of this program covered 9.3 miles of proposed reconstruction between 1.5 miles south of Forsythe Creek and Ridgewood Summit. In 1948-49 the southerly 5.2 miles of this section were reconstructed to modern two-lane standards by Guy F. Atkinson Company.

The present project undertakes the grading of the northerly 4.1 miles of the original project and will be developed to a four-lane expressway. It is planned to place the surfacing under a separate contract during the summer of 1954. Recent traffic studies



and current design standards dictated a complete realignment on new location and a 58-foot, four-lane all-paved section for the project.

Geological Formations Varied

Geologically, the formations on the project are quite varied and involved. The area is characterized by landslides and old fault lines which have resulted in numerous springs and unstable areas. Plastic grey to brown clays mixed with a large percentage of sandstone and schist particles are encountered throughout the project. Test borings indicate plastic clay layers extending to depths up to 100 feet in several fill areas. The low permeability of this material permits high hydrostatic pressures to develop with resulting instability unless corrective measures are undertaken.

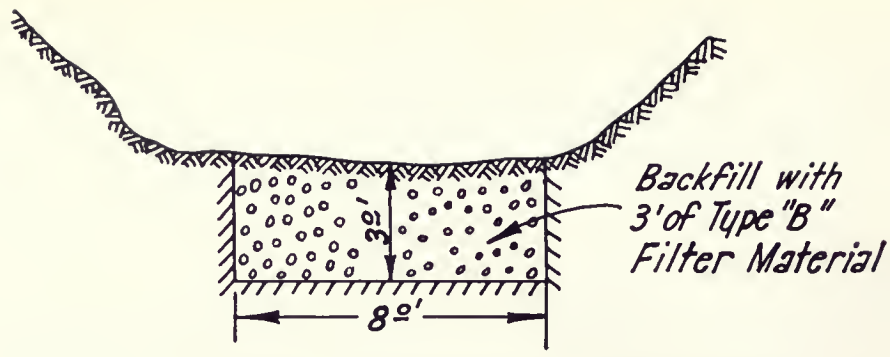
Because of the generally unstable nature of the terrain traversed throughout the project, the following design features were incorporated in the plans to provide corrective treatment of unstable areas:

1. Stabilization trenches
2. Channel stripping
3. Embankment foundation stripping

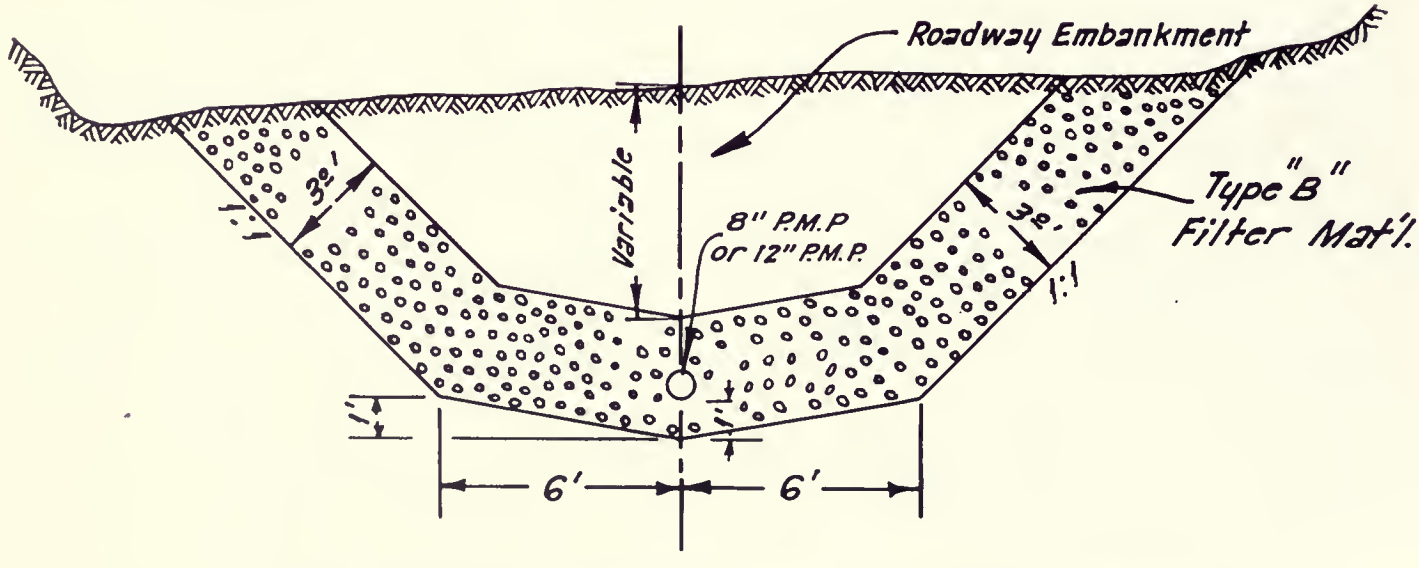
Stabilization Trenches

Stabilization trenches were designed where unstable fill foundations are well-defined and are usually located in swales or ravines. These trenches are 12 feet in bottom width, have 1:1 side slopes and are being excavated to depths varying from 5 feet to 25 feet. Complete subsurface exploration was not made during the design stage as the soil is too rocky for hand borings and the cost would have been prohibitive if all trenches were investigated by power drilling equipment. For this reason the design of the trenches was based on a few power borings and a geological study made by the Materials and Research Department. Hand borings were made during construction after excavating the trenches to approximate planned grade. Final depths to which the trenches will be excavated are based upon these hand borings.

Some of these trenches are "floating"; that is, they are not excavated to a firm bottom, as to do so would be prohibitive in cost. The trenches are generally constructed more or less normal to the highway but in some instances are constructed with wye branches. The bottom and side slopes of the trenches are blanketed with filter material three feet thick normal to the slopes, and the remaining part of the trenches backfilled with roadway embankment. Perforated metal pipe eight inches and/or 12 inches in diameter is placed in the filter material one foot above the bottom of the trench. These trenches are very effective in providing an outlet for seepage or subsurface waters and for dehydrating the surrounding ground and have proven very successful for fill stabilization on previous projects throughout the district. Seventy-seven stabilization trenches are being constructed on this project involving 63,000 cubic yards of trench excavation and 58,000 tons of filter material.



TYPICAL SECTION CHANNEL STRIPPING



TYPICAL SECTION - STABILIZATION TRENCH



Heavy constructian on section of Ridgewood grade project

Channel Stripping

A modified form of stabilization trench was designed for locations where existing water channels fall under embankments. These channels are being stripped to a width of eight feet and a depth sufficient to place three feet of filter material. This treatment is not intended to provide foundations for culverts as their location does not usually follow the existing channel, but rather to provide an outlet for seepage or subsurface water which might otherwise be trapped under the new embankment. Thirty-one such channels are to be stripped involving 5,400 cubic yards of channel stripping and 9,000 tons of filter material.

Embankment Foundation Stripping

Ten large embankment areas are being stripped to a depth varying from three feet to 10 feet to remove wet and unstable surface soils to provide a stable foundation for embankment construction. These stripped areas are blanketed with three feet of filter material prior to constructing embankments thereover to provide an outlet for seepage water. This work involved 25,000 cubic yards of excavation and 37,000 tons of filter material.



Slab trench showing pipe in place

Including filter material to be utilized for underdrains, a total of 107,000 tons will be required for the project. Specifications for filter material conform to those listed for Type "C" filter material proposed for the forthcoming new Standard Specifications. Gravel from Forsythe Creek about three miles south of the project is being utilized for filter material and the project. Gravel from this source meets specification requirements by simply scalping off the oversize.

Bench cut on Ridgewood grade project



Heavy Excavation

All of the above corrective treatments, although involving a large amount of work, may be considered as but preparatory to the grading proper, which involves some 785,000 cubic yards of roadway excavation. The short time limit of 155 working days made it mandatory for the contractor to plan a tight working schedule coordinating the preparatory work with the grading, which has been no easy task. Construction of the stabilization trenches, channel stripping, and embankment foundation stripping and backfilling with filter material before embankments can be constructed is further complicated by the necessity of utilizing material resulting from these excavations in the construction of embankments.

Vibratory Tampers

An innovation on this project is the required compaction of filter material by vibratory tampers. This re-

quirement was specified to minimize consolidation of the filter material subsequent to construction of the roadway, which has possibly been partly responsible for the settlement indicated at pavement grade on several previous projects.

It was considered that the vibratory method of compaction would be ideally suited to the granular type of material specified for filter material and that compaction by this method would prove to be both practicable and economical. A satisfactory field test procedure has yet to be developed to determine the relative compaction of a granular material such as filter material. Furthermore, actual compaction results that could be expected to be obtained with vibratory tampers was not known. For the foregoing reasons the cost of compacting the filter material by vibratory tampers was specified to be paid for as extra work in lieu of the customary procedure of specifying a minimum relative compaction requirement. The contract special provisions require that filter material placed in the bottom of stabilization trenches, channel stripping areas and for embankment foundation be placed in layers not exceeding 18 inches thick, and thoroughly compacted by the use of approved vibratory tampers, as directed by the engineer. Compaction of filter material placed on the side slopes of stabilization trenches is not specified as it is impracticable to compact this granular material and keep it in place on a 1:1 slope.

Equipment Used

The vibratory equipment furnished by the contractor for this work consists of three Jackson vibrating tamper units mounted on the front of a D-4 crawler tractor. Each vibrating tamping unit is 24 inches wide, so that the three units mounted side by side make a total tamper width of six feet. The tamper units are mounted similarly to a bulldozer blade and are easily lowered into position for compacting or raised for turning of the tractor just as a bulldozer blade is raised or lowered.

A Jackson power plant unit is mounted on the tractor and provides power for the three Jackson vibrating tamping units. The power plant consists of a small gasoline motor and electric generator. Each tamper unit is operated by its own electric motor. The tamper shoes are leveled in front and are operated only on the forward motion of the tractor. Generally three to six passes are made over an area to be compacted at a travel speed of about 24 feet per minute. This equipment operates satisfactorily on grades up to 25 percent. Compaction results being obtained with this equipment have not been fully evaluated and further analysis must be made before arriving at any conclusions relative to compaction of filter material by vibratory tampers.





UPPER—Settlement platform set-up may be seen on left. LOWER—Close-up of settlement platform.

Erosion Control

The seeding of fill slopes is planned throughout the project as an erosion control measure.

No special preparation of slopes for seeding is planned; however, as an additional erosion control measure the special provisions require that the surfaces of all embankment slopes shall be rolled with a tamping roller, a total of 12 times or six round trips of the roller.

Embankment settlement subsequent to surfacing of the finished roadway is, of course, undesirable and engineers strive to prevent this condition by adhering to well-accepted construction practices during construction. Unfortunately, some large roadway embankments do settle, even though foundations were stripped or recompacted and compaction requirements strictly enforced throughout construction of the embankment. Such settlement may be caused by consoli-

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Portola Overhead

F. A. S.-County Funds Finance Plumas County's Road System

By A. C. DONNENWIRTH, County Supervisor

Two steel girder bridges, with concrete slab decks, one 255 feet in length across the Middle Fork Feather River and the other, 196 feet long spanning the tracks of Western Pacific Railroad, are now under construction.

This project, known as the Portola Overhead, was first proposed in 1935 after having been discussed locally since the early twenties. A group of Portola businessmen tried to undertake this work under the Public Works Administration. At that time Portola was an unincorporated town of about 1,500 people and its leaders were poorly organized to present a united front. When PWA officials arrived to make a survey, it was found that there were three groups, pulling in different directions, each having a favored crossing of the river. It took two years to reach an agreement favorable to all groups concerned and when a final decision was made the PWA no longer existed.

Project Materializes

The next attempt was made by the county in 1945 at which time $25,000 was placed in the budget under Portola Overpass Capital Outlay. This amount was increased to $50,000 in 1949 and thanks to the tireless efforts of the present board of supervisors the project was materialized this year at a cost of $290,245.84 with the aid of federal secondary funds.

Portola is an important business center for the eastern portion of Plumas County, and a division point of the Western Pacific Railroad. It has a population of about 3,400. It is also the trading center of Sierra Valley.

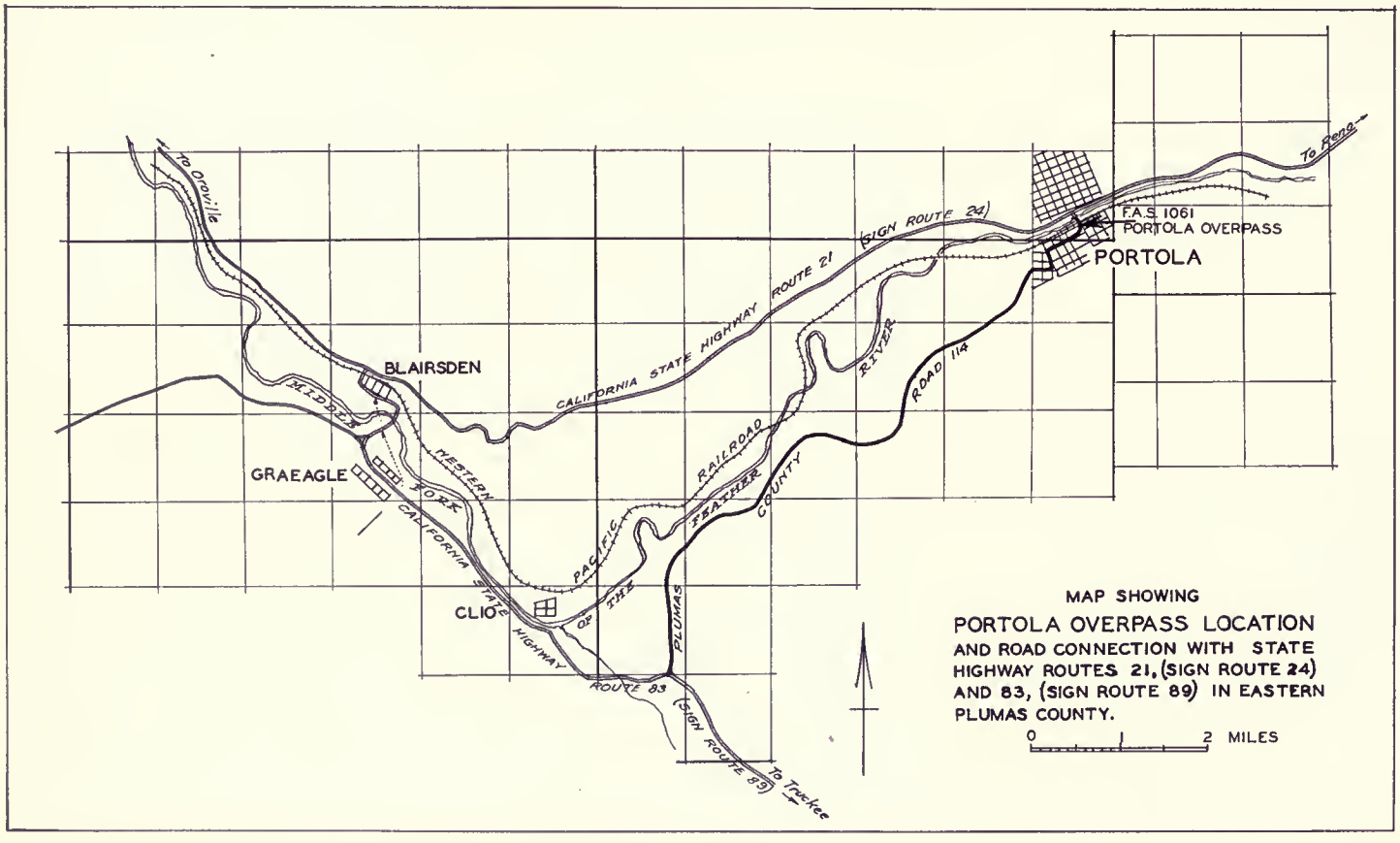
The town is evenly divided by the Feather River and by the tracks of the W. P. R. R. The schools, post office, banks and most of the business section are on the south side. The north side is at present growing at an accelerated rate and it is anticipated that soon will be as large as South Portola.

Trains Cause Traffic Delays

Train movements through Portola create very serious traffic delays, particularly when fire engines, police cars or ambulances are involved. At times, there are trains of more than 125 cars

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UPPER—Frequent traffic delays at existing railroad grade crossing in Portola will be a thing of the past when the new FAS railroad overhead and bridge are opened to traffic. LOWER—As grade crossing looks without blocked traffic.






RAIL
CROSSING
ROAD
3
TRACKS
WESTERN PACIFIC

Bond Program

Contra Costa County Completes First Bond Issue Project

By W. C. DALTON, County Highway Construction Engineer

THE COMPLETION of a 3.6-mile section of the Byron Highway in eastern Contra Costa County marks the first step towards completion of a $10,250,000 county road bond issue program. It is noteworthy that this first contract was also a federal aid secondary project, since the FAS program has had an important influence on the postwar construction planning in Contra Costa County.

The contract just completed was awarded December 5, 1952, to the Stephens Trucking Company of French Camp with the stipulation that roadway work would not be undertaken until about April 15, 1953. Structures and incidental items were constructed during the winter and the contractor was able to concentrate on major roadway items under favorable weather conditions. Work was completed August 27, 1953, with a final cost of $214,700 exclusive of engineering.

The geometrical section (two 11-foot traffic lanes flanked by 7-foot shoulders) of this job was identical with that used on the FAS project adjoining on the north which was completed in 1951. The traffic lanes are paved with plant-mixed surfacing three inches thick, the 3-foot strip of shoulder adjacent to the plant-mixed surfacing has a double seal coat treatment, while the outside four feet of shoulder has a penetration treatment.

> Contra Costa County is to be congratulated for its straightforward approach to the solution of its traffic problems.
>
> G. T. McCOY
> State Highway Engineer

Difference in Projects

The major difference between the two FAS projects is in the structural section. The project just completed has a 6-inch thickness of crusher-run base under the plant-mixed surfacing and seal coat. This was placed on the old 5-inch thick Portland cement concrete pavement or on imported subbase material five to twelve inches thick. This section contrasted with the earlier project where better base and drainage conditions prevailed and where the plant-mixed surfacing was placed directly on the old pavement which had been patched and widened with five inches of crusher-run base that had been treated with 2 percent of Portland cement. Imported base material supported both the cement-treated and untreated crusher-run base shoulder strips.

One unplanned difference in the two projects which may affect future maintenance was the quality of the two kinds of imported base materials. The first job was constructed with material from a local sand deposit which required rigid grading, blending, and compaction controls, whereas on the recent contract, Stephens Trucking Company elected to haul from a pit at some distance from the project where the pit-run material was almost equal to crusher-run base in most respects.

Railroad grade crossing on Byron Highway, a county road in eastern Contra Costa County, is modernized with flashing light signals, improved alignment and extra width for busses and petroleum trucks which must stop at all grade crossings





New Byron Highway as viewed from Alameda County. This project was the first to be completed under the new $10,000,000 county road bond issue. (No negative available.)

State Procedures Followed

As mentioned above, the influence of Contra Costa County's FAS projects on the engineering of other county work has been notable. A much improved knowledge of the changes and current application of special provisions and state specifications has been achieved. Structural designs and material controls have served as a guide on other county projects.

The State Division of Highways' Construction Manual is used on county projects with as little deviation as possible. The construction procedures and forms used by the Division of Highways have been adopted as standards by the county construction division and will be used on all bond projects. This policy, in general, permits the county construction forces to draw on the experience of the State, and it also tends to stabilize contract and material prices within the county.

With the approval of the county road bond issue by the voters last year, the county highway department's engineering staff began preparing plans for the most urgent projects. An expansion of this staff was necessary to complete the bond issue work in the scheduled five-year period, but this expansion was held to a minimum by contracting for aerial surveys, topographic maps, and other surveying and engineering services. The reorganization of the county highway department had been achieved prior to the bond issue approval with four main divisions being established directly under the road commissioner. These divisions are administration, engineering and planning, construction, and maintenance. The staff and service functions of rights of way, materials and testing, traffic, records, surveys, structures, and accounting have been integrated with the main divisions in such a way as to permit independent or coordinated operations. Emphasis was placed on the need for keeping engineers on engineering work, and to this end much of the office routine as well as certain nontechnical field work has been reassigned.

Bond Issue Program

Progress on the bond issue program is difficult to estimate in terms of dollars at the present time because only three projects totaling $300,000 are beyond the advertising stage. However, an additional $1,650,000 of roadway and structure contracts are off the drawing boards and should be under way before the end of 1953. This group consists of four projects, two completely engineered by the county, one by the State, and one by a consulting engineering firm. One of the county-engineered jobs will be a FAS project. The projects not designed by the county involve major structures which will cost about $350,000 each. The project being handled in its entirety by the Division of Highways consists of an overpass and connections to the Arnold Highway at Loveridge Road near Pittsburg. The State had the basic design information for this heavy industrial freeway interchange and its cooperation in this project resulted in considerable savings to the county in time and money. The Tudor Engineering Company of San Francisco is preparing plans and specifications for the L Street underpass in Antioch, another connection to the Arnold Highway. This firm also prepared the deficiency report on county highways which was the basis for the $10,250,000 bond issue.

Surveys and plans have been started by the road commissioner's staff and are in various stages of completion on another projected $1,240,000 worth of bond issue work, and consulting engineering firms have been engaged to survey three of the larger projects totaling $1,850,000. Target dates for contracting most of the above-mentioned projects are within the next 20 months.

The resident engineer, on the first bond contract was R. B. Vaile and Lee Stephens was the contractor's superintendent. The county road commissioner is Victor W. Sauer.

New Freeway

Oceanside-Carlsbad Project Opened With Ceremonies

By RALPH A. LEJONHUD, Projects Engineer

THE OPENING of the Oceanside-Carlsbad Freeway marked the completion of a project that was actually started some 13 years ago. In 1940 the inadequacies of the state highway along Hill Street in the City of Oceanside were already apparent. During that year a cooperative project involving some of Oceanside's ¼-cent gas tax funds was initiated. This early project, which contemplated widening the existing street by decreasing the sidewalk area through the business district as an interim improvement, was abandoned because of the shortage of men and materials, combined with rapidly rising costs caused by World War II. It was already obvious that Hill Street could not be considered as the ultimate highway location.

The problem of highway routing is always a major factor in community planning and there was an increasing demand that the ultimate highway location be definitely established. The California Highway Commission approved surveys and plans for the Coast Highway between the San Diego north city limits and the Oceanside north city limits on July 18, 1946. On March 26, 1947, District XI, Division of Highways, submitted a report discussing the problem of ultimate location through Carlsbad and Oceanside.

Ten Locations Studied

A total of 10 possible locations were discussed but no one route was definitely recommended. Various officials of the City of Oceanside, including the mayor, members of the planning commission, school board and city council, met with representatives of the Division of Highways on April 23, 1947, to discuss these possible routings. The ultimate location was narrowed down to two alternatives, both of which involved some conflict with Oceanside school property. In an attempt to find a solution that would be satisfactory to all agencies, members of the Oceanside School Board, State Department of Education, and representatives of the Division of Highways met in conference in Los Angeles on May 8, 1947, to discuss the conflict

. . . Continued on page 20

Hill Street in Oceanside, looking north, showing traffic conditions prior to freeway opening



Freeway Ceremonies

WITH BANDS and fanfare, the Oceanside-Carlsbad Freeway in San Diego County was opened to the use of the public at 5 p.m., November 16, 1953.

The Oceanside High School Band, dressed in Kelly green uniforms with white trimmings and their majorettes dressed to match, were on the northbound lanes of the freeway. Massed on the southbound lanes was the Marine Band from Camp Pendleton, dressed in their "blues."

All the dignitaries of San Diego County were seated on the platform. The highest state official to attend the ceremonies was Lieutenant Governor Harold J. Powers. Highway Commissioners Harrison Baker, James A. Guthrie and Charles T. Leigh, Deputy State Highway Engineer R. M. Gillis, Special Assistant to the Director of Public Works Fred Bagshaw, E. E. Wallace, District Engineer of District XI, State Senator Fred Kraft; Assemblymen L. M. Backstrand, Riverside, E. S. Bulen, Escondido, and Frank Luckel, San Diego, county board of supervisors representatives, mayors of practically every city in western San Diego County, major generals from Camp Pendleton and a captain from the Eleventh Naval District, made up a partial list of the guests for the festivities.

Immediately after the ceremonies on the freeway, guests were entertained by the Carlsbad Chamber of Commerce at the Carlsbad Inn. At 7 p.m. more than one hundred guests sat down for dinner at the Colonial Inn in Oceanside as guests of the San Diego Chamber of Commerce.

—R. C. K.



Looking south, showing new highway location on left and old route on right through Oceanside



Looking north, showing freeway through Oceanside. Vista Way grade separation in foreground.

SUMMARY OF CONTRACTS FOR OCEANSIDE-CARLSBAD FREEWAY

Unit	*Length †*	*Contractor*	*Construction cost, including construction engineering*
¼ mile south of Mission Ave. to San Luis Rey River; grade, pave and structures	1.06	Cox Bros. Const. Co.	$1,084,000
0.7 mile south of San Marcos Creek to 2.2 miles south of Carlsbad; grade, pave and structures	3.21	Cox Bros. Const. Co.	739,000
0.13 mile south of the San Luis Rey River to Camp Pendleton main entrance; grade, pave and structures	0.51	Chas. MacClosky	1,055,000*
Buena Vista Lagoon to ¼ mile south of Mission Ave.; grade, pave and structures	2.09	J. A. Payton and Bent Const. Co.	1,763,000*
2.2 miles south of Carlsbad to Buena Vista Creek; grade, pave and structures	4.40	Bressi & Bevanda Constructors, Inc.	2,497,000*
¼ mile south of Mission Avenue to San Luis Rey River; erosion control and protective screen planting	---	Castro and Fisher	29,000*
Buena Vista Creek to Monterey Drive; highway lighting	---	Ets-Hokin & Galvan	51,000*
South city limits of Carlsbad to Buena Vista Creek; highway lighting	---	Ets-Hokin & Galvan	33,000*
Hill St. to Capistrano Drive in Oceanside; grade and surface	---	Pending	23,000*
Miscellaneous signs and striping	---	Miscellaneous	24,000*
Construction totals	10.5†		$7,298,000
Rights of way			1,950,000
Grand total			$9,248,000

* Based on latest estimates. Final figures not yet available.
† Total shows net length over-all. Because of connections, ramps, etc., there is some overlap between individual projects.



Oceanside-Carlsbad Freeway looking south. Brooks Street overcrossing in immediate foreground.



Looking north an freeway through Carlsbad. Tamarack overcrossing in center foreground.

between school and highway developments.

Freeway Agreements Signed

After approximately two years of study and investigation of all possible locations in the area, the California Highway Commission on September 14, 1949, adopted as a freeway a location which bypassed the various business districts and yet was close enough to provide adequate traffic service to the communities. This adoption was revised slightly on June 21, 1950, to avoid anticipated improvements in the Agua Hedionda area.

Final agreement between the various public agencies was completed with the signing of freeway agreements with San Diego County on August 1, 1950, for the county section between 2.2 miles south of Carlsbad and the south city limits of Oceanside, and with the City of Oceanside on August 23, 1950, for that portion within the city limits of Oceanside. The southerly portion of the proposed freeway, from San Marcos Creek to 2.2 miles south of Carlsbad, was covered by a freeway agreement with San Diego County signed on March 26, 1951.

First Unit

The first unit of work, covering that portion from one-fourth mile south of Mission Avenue to the San Luis Rey River, was advertised on February 16, 1951, and work finally started on March 26, 1951. The complete 10.5-mile project, extending from 0.7 mile south of San Marcos Creek to the Camp Pendleton main entrance, was constructed under a series of five major contracts plus several minor contracts for highway lighting, landscaping and erosion control, signs and stripes, etc. These various contracts are tabulated at the end of this article. The total cost of the complete project, including rights of way and construction engineering, will be approximately $9,248,000. Final figures on all contracts are not yet available.

The completed freeway will remove highway traffic from a city street that is critically inadequate for handling present traffic demands. Police records indicate an average of 34± accidents per month for the 3¼-

mile portion of Hill Street within the city limits of Oceanside, due primarily to the narrow streets and congestion with heavy vehicular and pedestrian traffic.

Population Growth

There are nine sets of traffic signals along the old city street route that are being eliminated or bypassed by the new freeway. A review of the population growth will illustrate the congestion of the previous location. When the population of Oceanside was only 4,651, in 1940, Hill Street was already inadequate for highway traffic. By 1953 Oceanside's population had more than tripled to a total of 18,377. In addition to the expansion of Oceanside, the City of Carlsbad with a population of 6,963 was incorporated July 16, 1952. Carlsbad is contiguous to Oceanside on the south. The freeway is an effective bypass of the Cities of Carlsbad and Oceanside, and yet is in close proximity to the business and residential areas. Traffic separation structures at 15 locations provide access and effective service to and from all of these areas.

Major Features of Project

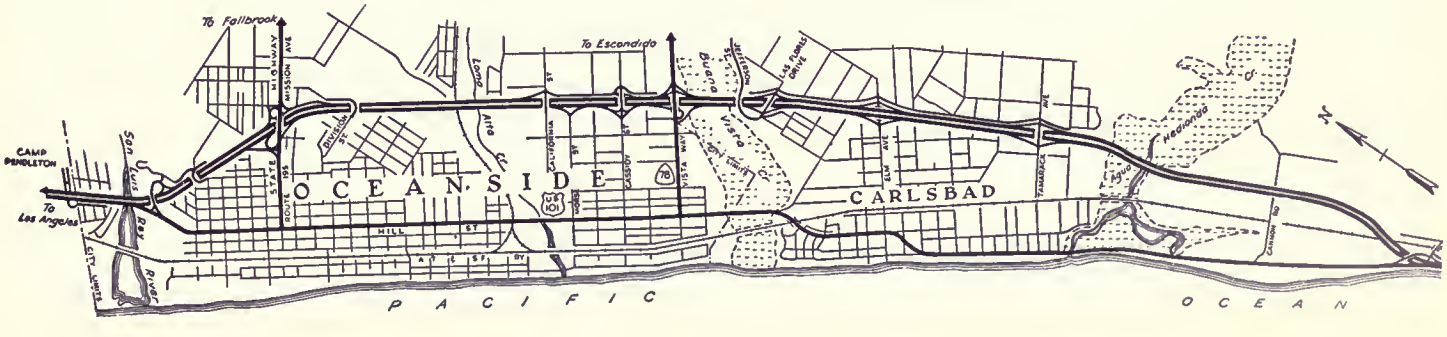
Some of the major features involved in construction of this freeway were the widening and remodeling of a 950-foot steel truss structure across the San Luis Rey River to provide a Y connection north of the Oceanside business district; the crossing of six major water courses, some of which involved the removal of up to seven feet of unsuitable silt and replacement with selected material; the construction of traffic separation structures at 15 locations; the construction of railroad separation structures at two locations, and the construction of a pedestrian undercrossing in the City of Carlsbad.



Bands, dignitaries and spectators add color to dedication of new freeway

Because of the divided roadbed section, the complete project involved a total of 33 structures of which 30 were new construction. One existing structure, the San Luis Rey River bridge, was remodeled and widened and two others south of Carlsbad on the existing road were used for one direction of traffic without requiring any additional work. Although cuts and fills were not excessive, the project involved the handling of approximately 2½ million cubic yards of material. The traveled way was surfaced with 87,000 cubic yards of Portland cement concrete supplemented with 20,000 barrels of Portland cement for cement-treated base and subgrade. The structures involved the furnishing and placing of approximately 2½ million pounds of structural steel and 4¼ million pounds of bar reinforcing steel. Forty-one thousand feet of storm drains and culverts were installed, plus an additional 21,000 feet of pipe for sewer, water and sprinkler systems. Rights of way for the complete project involved the acquisition of 292 separate parcels at a total cost of approximately $1,950,000.

Sketch map shows termini of newly opened section of freeway



Castro Valley Job

New Freeway Section Will Break Bottleneck on U. S. 50

By A. A. ANDRADE, Resident Engineer

A MAJOR bottleneck to the flow of traffic on U. S. 50 between the metropolitan East Bay area and the San Joaquin Valley has been through Castro Valley. Under construction is the Castro Valley Bypass, a full freeway approximately 1.5 miles in length, from point opposite Crow Canyon on the east to approximately one-tenth of a mile easterly of Foothill Boulevard on the west.

U. S. 50 is an east and west arterial of great importance connecting the San Joaquin Valley with the Oakland-San Francisco metropolitan residential and industrial areas. The reactivation of Camp Parks as the Parks Air Force Base and the construction of an Atomic Energy Research Laboratory further to the east increases the importance of this route. These federal installations have promoted a very heavy influx in population, resulting in a proportional increase in traffic volume.

Project One of Series

This project is one in a series along this route to be recently placed under construction. An 8.4-mile section of Altamont Pass between Greenville and Mountain House was constructed in 1938 as a four-lane divided highway. Progressive planning and construction saw an additional 5.8 miles west of Livermore, commonly known as the Livermore Bypass, opened to traffic late in 1950.

Early in the fall of 1950 construction work began on the next link of this continuous chain of four-lane divided highway, commencing 1.5 miles west of Livermore and extending 5.9 miles to Hopyard Road. Another section of this route from the westerly terminus of the previous contract was opened to traffic in December, last year, extending the four-lane freeway to a point 2.5 miles west of Dublin. There is a gap of approximately six miles from this westerly point to the easterly limits of the Castro Valley Bypass, plans for which are being prepared at the present time. Another section, extending the freeway easterly from the Altamont Pass section, seven miles to Coral Hollow Road just west of Tracy, is now under construction and is scheduled for completion in 1955.

Hazardous Intersections

The contract for the Castro Valley Bypass was awarded to Fredrickson Brothers Construction Company on June 4, 1953. The existing roadway in this section consisting of three-lane concrete pavement through the business district of Castro Valley, with several hazardous intersections and with a large percentage of truck and local shopping traffic, presented an over-all dangerous condition as well as a heavily congested peak-hour traffic tie-up.

The new freeway will provide two Portland cement concrete 12-foot traf-

Looking east from Redwood Avenue overcrossing





Looking north toward Redwood Avenue overcrossing

fic lanes in each direction, divided by a variable 12- to 16-foot median strip. A frontage road parallel to the freeway from Redwood Road to Strobridge Avenue, which allows local residential area access, and the numerous on and off ramps are to be constructed of plant-mixed surfacing with barrier-type curbs and gutters.

Major Structures

Major structures to be constructed are the Redwood Road, Strobridge Avenue, Mattox Road and the right bridge of the Castro Valley Undercrossings, all of which are of the concrete girder type. Major drainage structures include a double 8- by 5-foot reinforced concrete box at Castro Valley Creek and a double 6- by 6-foot reinforced concrete box at Lake

Looking east toward Strobridge Avenue undercrossing





Looking east from west end of construction

Chabot Creek. There is also a pedestrian undercrossing to be constructed near Lake Chabot Road.

The new alignment is entirely tangent with the exception of one 2,500-foot radius curve near the westerly terminus of the project. The maximum gradient is 3.14 percent at the westerly end of the project. Other maximum grades within the project limits are 3 percent on the approaches to the various undercrossings.

Grading involves two heavy cut sections, one of approximately 55 feet in depth and another involving cut and fill sections through an old rock quarry of 32 and 24 feet in depth, respectively. About 20 percent of the excavated material has been placed in embankment just westerly of Foothill Boulevard to provide for the ultimate extension of Route 228 westerly to connect with the Eastshore Freeway at the Washington Avenue interchange at San Lorenzo, plans for which are complete and rights of way being acquired.

Heavy Equipment

Major grading equipment being used by the contractor includes five DW-10 Caterpillar jeeps and scrapers, supplemented by five D-8 Caterpillar dozers, two LeTourneau Turnapulls and a D-8 Caterpillar dozer and scraper. Material excavated for the fill westerly of Foothill Boulevard was accomplished by a Northwest No. 80 shovel and hauled to the embankment area by a fleet of seven 10-wheel dump trucks.

Major construction items on the present contract include 2,100 cubic yards of concrete removal, 401,200 cubic yards of roadway excavation, 18,900 cubic yards of structure excavation, 8,270,000 station yards overhaul, 6,750 barrels of Portland cement for cement-treated subgrade and base, 11,000 tons plant-mixed surfacing, 2,300 cubic yards curb and gutter concrete, 10,670 cubic yards pavement concrete and 4,300 cubic yards of structure concrete. There is also 4,764 feet of cast-in-place concrete piling and 7,500 feet of reinforced concrete drainage pipe.

Construction work began on June 10, 1953, and the estimated completion date is September 29, 1954. At present the project is approximately 35 percent complete. Financing is from both state gas tax and federal aid funds.

Construction is under the supervision of Assistant State Highway Engineer B. W. Booker and Assistant District Engineer R. P. Duffy. The author is Resident Engineer, and R. L. Hood is general superintendent for Fredrickson Brothers Construction Company, contractor.

RATHER SURPRISING

THE FLYING TIGER LINE INC.
Burbank, Calif.

MR. KENNETH C. ADAMS, *Editor*

DEAR MR. ADAMS: We have been receiving a copy of *California Highways and Public Works* for sometime and I want to take this opportunity of congratulating you and your staff on the excellent reading material it contains.

You might not think that the air freight business could use a publication such as yours but it is being constantly read by our department heads and put to valuable use in the conduct of our business.

GEO. T. CUSSEN
Vice President

Ripon-Manteca Job

San Joaquin County's First Full Freeway

By K. N. HATCH, Resident Engineer

THE FIRST contract for a full freeway in District X was issued as a joint venture to Lord and Bishop of Sacramento and M. J. B. Construction Company of Stockton in mid-July of this year. This contract will convert existing US 99 to a full freeway between Ripon and Manteca in San Joaquin County and will be the first of an anticipated series of full freeway contracts in District X.

The total mileage of full freeways in District X will be limited and restricted, in general, to the most important routes such as US 99, US 50, and US 40. The northerly end of this project is designed to tie in with a future full freeway bypass of the City of Manteca. This $1,180,000 contract will provide four and one-quarter miles of four-lane divided highway with full controlled access.



Flagman regulates traffic through construction from elevated platform

Frontage Road and Structures

A frontage road to serve local traffic will be constructed on the northeasterly side of the freeway for almost the entire length of the project. Because the present two-lane highway parallels the Southern Pacific Railroad tracks, it was necessary to construct a frontage road on one side of the freeway only. Two overcrossings, one near each end of the project, will provide full interchange facilities to and from the freeway.

The existing two-lane pavement was incorporated in the design as the southbound lanes of the freeway, except at the overcrossings, where the present road will be utilized in the traffic interchange systems. It was necessary to "bow" the freeway alignment at the interchanges to permit the overcrossing county roads to return to grade immediately adjacent to the

Looking north from Ripon end of project. Existing two-lane highway on left and frontage rood on far right of new lanes under construction.



northeasterly side of the Southern Pacific Railroad tracks. Initial county road railroad crossings are at grade; the interchange design, however, will permit future separation over the railroad tracks when warranted by traffic on the county road.

Design of Overcrossings

Overcrossing structures are located on Jack Tone and Austin Roads, two important county highways. The structures will be of reinforced concrete, each consisting of two continuous box girder spans supported by a reinforced concrete center and hollow type reinforced concrete abutments. The center bent and the abutments will be placed on reinforced concrete piles.

Right of way for this project totaled about 100 acres acquired in 50 separate parcels. In the acquisition of the right of way, it was interesting to observe the complete acceptance of the full freeway design principal by the abutting property owners. All right of way was acquired by mutual agreement without the necessity of condemnation trial.

Except for a coaxial Pacific Telephone and Telegraph repeater station, the right of way was cleared by the time the contract was awarded. This station operates automatically, amplifying the speaking voice for the circuit linking the west and east coasts. The heavy brick building, including cables carrying hundreds of wires, was moved from the right of way with no interruption of service.

Traffic Regulated

The borrow pit, for an estimated quantity of 350,000 cubic yards of imported borrow, is located on the southwesterly side of the Southern Pacific Railroad tracks. This material is being hauled across the railroad and the existing two-lane highway in dump trucks which are loaded in the pit by a 2½-cubic-yard Northwest dragline. Location of the pit results in about 80 additional truck movements per hour across the railroad and the existing highway.

Traffic on the existing highway is regulated at the truck crossing by signs, flashing yellow lights, and two flagmen stationed on elevated platforms at the edges of the shoulders.



Moving Pacific Telephone & Telegraph Company's repeater station

To date, this method of traffic control has been very satisfactory. It has resulted in a minimum amount of traffic hazard and very little delay either to the traveling public or the contractor's operations. Although almost 35 percent of the imported borrow already has been hauled, only two minor rear-end collisions have been experienced to date.

Drainage System

Drainage for this four and one-quarter mile project is unusual because of an almost complete absence of drainage facilities. There are no drainage pipes under the existing highway, and the few that will be placed under the new northbound lanes will serve primarily as equalizers.

Storm water will seep directly into the native soil or will be carried by side drainage to specified percolation areas within the right of way. This design is feasible because of several factors. The area traversed is flat and without defined waterways; the native soil has high absorptive qualities, and the annual rainfall of 11 inches is moderately low.

The existing pavement (southbound lanes), frontage road, ramps, and

. . . Continued on page 64

New Trinity Road

Weaverville to Douglas City Job Recalls Early Days

By RAY HUCK, Resident Engineer

On May 25, 1953, a $432,000 contract was awarded to M. W. Brown and R. E. Hertel for construction of 2.34 miles of road on US 299-W along Weaver Creek, four miles south of Weaverville to Douglas City in Trinity County. Letting of this portion of road was accelerated by loss, during last winter's high water, of a second span of Weaver Creek Bridge. The contract set up 180 working days for completion of the project with a deadline of November 1, 1953, for completion of bridge work.

Ray Hertel, by special agreement with the laborer's union, worked during a portion of last summer's strike and completed the 218-foot concrete girder bridge under the deadline.

Easy Grade

Grading, being done by Monte Brown, consists of a 32-foot roadbed topped with 0.5-inch cement-treated base and 0.2-inch plant-mixed surfacing. The line has been dropped down against Weaver Creek to eliminate curvature and decrease yardage, with the creek side of fills being protected by rock slope protection throughout. Grade rate is about 1 percent and finish grade is held to a minimum of 12 feet above the creek which at times becomes violent. Rough grading will be completed this year with base and surfacing placed when weather permits in 1954.

The present Highway 299-W from Tower House to Weaverville was a good road in its day, but like so many others of the State's highways, it is becoming old fashioned. This road tends to follow contours instead of bravely venturing straight forward from cut to fill. In a stretch of seven miles from Trinity River to Fawn Lodge, there are no stretches suitable for passing except by courtesy (often practiced) of the lumber or logging truck driver who slows down and pulls over to permit the strings of fas-

Present Weaver Creek Bridge that lost a span in last winter's flood. All the gravel in this creek channel has been mined many times.



ter vehicles to zip around. The combination of sharp curves and narrow roadbed often makes it mandatory for truck and trailer combinations to stop and ease by each other when meeting at the tight spots.

Although by 1950 census Trinity County had only 5,087 population, astounding to see is the amount of mixed traffic using the highway. Load after load of logs and lumber interspersed liberally with cars of commuting sawmill workers and loggers, an occasional woman driver and hordes of sportsmen.

No Roads in Early Days

One hundred years ago the field for highway engineers in Trinity County was strictly open. That county, one of the original 27 whose boundaries were approved by an act of the First Legislature of the State of California February 18, 1850, contained over 5,000,000 acres—but no roads. Subsequent statutes slashed off Humboldt and Del Norte Counties, leaving Trinity with an area of 2,042,880 acres—all mountainous—all virgin territory for the road builder.

Major P. B. Reading discovered gold on the Trinity River in July of 1848 at Kanaka Bar which later became Douglas City. This was some 20 miles northwest of the Spanish land grant Buenaventura which he owned.

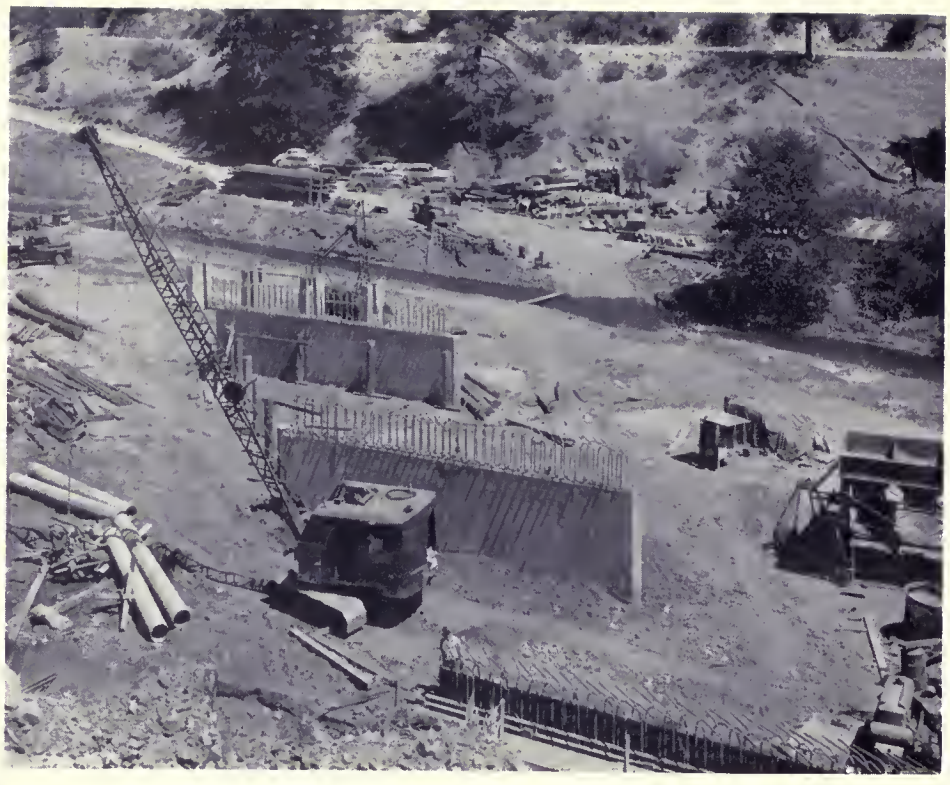
He went back to his rancho, recruited a party of 62 Indians and two white helpers. They took along about 100 head of cattle for food. In six weeks they had taken out about $80,000 in gold.

At that time a party of Oregonians appeared and took considerable exception to Reading's Indians. They stated that, in their estimation, "The only good Indians were dead ones."

Reading assessed their intent and arms. His party was equipped for mining and not fighting. He withdrew his party. Actually, he was not too much put out. He felt he had enough for his needs. "I left the stream," he said, "and returned to my home where I have since remained in the enjoyment of the tranquil life of a farmer."

Trinity Gold Rush

Following Reading's discovery of gold in the bars of the Trinity River, hordes of seekers invaded the area and by the end of 1851, most all of the Trinity area had been explored and prospected, but no roads yet built to link this rich area to the "outside." Within the next couple of years most of the tillable parcels of land were taken up by the longer visioned settlers who fattened their poke by furnishing supplies, food and accommodations for the miner, foot traveler or the horse or mule pack trains which at that time held a monopoly on transportation of supplies. It is reported that 10,000 pack animals trailed out of "Old Shasta" to Trinity and on north to Oregon.



Substructure of new bridge about 700 feet above old one

Along about that time, the early 1850's, a road was built from Weaverville down Weaver Creek to Kanaka Bar, thence down the Trinity River to Steiner's Flat. We have been unable to unearth any construction information on this road, but it would accommodate wagons. Those wishing to go down the Trinity River from Steiner's Flat to Junction City simply waited till summer's low water and then forded the river and traveled the bars.

High Prices in Diggings

Probably in this same period a native of Great Britain, though probably of Irish stock, named William Kelly, came to California and wrote "A Stroll Thru the Diggings of California." He landed at San Francisco, went to Sacramento, visited the Feather River, Upper Sacramento and Trinity River areas.

Before leaving the lower Trinity area he made this statement:

"The price of flour at the small settlement, when they left was five dollars per pound; pork, four dollars; beans, three dollars; coffee was cheap being abundant; and sugar normal as nine-tenths of the miners dispensed with its use; but spirits of any kind had attained the monstrous figure of sixteen dollars per pint. Oh, for a few puncheons of Cambelton of Islay whiskey there! and a snap of the fingers for the diggings!"

He then added this note to his observations:

"I concur with Colonel Fremont that the great natural wall of the Sierra Nevadas produces many modifying influences on the climate, owing to which tropical fruits may be pro-

duced at high northern latitudes. But according to my experience, my humble opinion is, that California must ever be mainly dependent on the States, Oregon, Chile, Australia and the Sandwich Islands for its supply of bread stuffs and other great staples of existence."

First Wagon Road

It wasn't until 1857 that W. S. Lowden and others, formed a joint stock company known as "Weaverville and Shasta Wagon Road Company," and started work on the first wagon road into Trinity County. That toll road, known locally as the Buckhorn or Grass Valley Toll Road, started from Tower House in Shasta County, up Willow Creek, through Buckhorn Pass, then down Grass Valley Creek to the W. S. Lowden ranch, across the Trinity River on Lowden's bridge, up Trinity Gulch to the top of Brown's Mountain and down Little Brown's Creek to its junction with Weaver Creek, a point three miles from Weaverville by public road.

The tolls on this road were set by the franchise granted by Trinity County. They were:

Saddle horse—round trip—$1.
Stock—$0.25 per head one way.
Two-horse wagon—round trip—$3.
Each extra span of horses—$1.
$1 additional if two wagons were used.

Many River Crossings

The Buckhorn Road, as at first constructed, had a maximum grade of about 10 percent. To avoid heavy grading around the rocky points, the road crossed Willow Creek, the stream leading west from Tower House, and Grass Valley Creek, more than a hundred times, mostly over log bridges. This 24½ miles of road was completed in the spring of 1858 at an estimated cost of $22,352, including bridges and including surveying $1,000, clearing $2,000 and toll house $450. That initial cost figures a little under $1,000 per mile. Repair and replacement of bridges was a costly maintenance item and after the floods of the winter of 1861-62 washed out many of the bridges, the road was rebuilt on alignment eliminating most of the crossings at a reported cost of $15,000. This road was considered one of the finest in the State.



New Weaver Creek Bridge

Farming of the small but rich pieces of bottom land boomed in those gold rush days, supplying food for the mass of men working the placer mines, and hay and grain for the great number of pack animals. Heavy freight charges dictated a policy of self proviso and prudence. Flour mills were erected at Hayfork and Minersville and nearly all of the meat products such as ham, bacon and lard were produced in the communities where used.

As placer mining gave way to the newer large scale hydraulic methods, lumber came into great demand for the large tail flumes, riffles, blocks, etc., and the small sawmills of former years were equipped with more effective machinery—so the Trinity County lumber business was born and has now grown to a major position in this great California industry.

Highway Officials Elect California Engineer

CALIFORNIA'S outstanding achievements in highway construction were recognized by the American Association of State Highway Officials at its annual convention in Pittsburgh, Pa., when it elected George T. McCoy, State Highway Engineer, first vice president.

A. E. Johnson, Director of Highways of Arkansas, was chosen president; and Mark Watrous, Chief Engineer of Colorado Highways, was elected regional vice president of the Far West.

Of particular interest to California was the action of the association in adopting a resolution memoralizing Congress to appropriate $53,400,000 for constructing highways through national forests. The resolution pointed out that the movement of heavy log loads over forest highways is causing the destruction of roadway surfacing built for light traffic.



GEO. T. McCOY

Record Budget

Highway Commission Allocates Total of $298,998,830 for 1954-55 Fiscal Year

A STATE HIGHWAY BUDGET containing an all-time high of $205,110,000 for major construction purposes for the fiscal year beginning July 1, 1954, has been adopted by the California Highway Commission. It is believed to be the largest annual state highway budget of any state in the Nation's history.

The 1954-55 budget allocates $145,387,000 for major construction projects and construction engineering, and $59,723,000 for the acquisition of rights of way for future highway improvement, out of a total of $267,241,290 for all state highway purposes.

It provides for improving a total of 585 miles of highway, including many sections of multilane urban freeways, intercity expressways, and a large mileage of rural routes.

Higher Than Revised Budget

The new budget is slightly higher than the 1953-54 state highway budget as revised by the commission last July following the enactment of increased highway user taxes by the Legislature at its 1953 session. The revised 1953-54 budget came to $247,000,000, of which $190,000,000 was allocated for major construction purposes.

The effect of the increased revenues in speeding up highway improvement is shown by a comparison with the last budget before the new legislation. The 1954-55 budget amount for major construction purposes is 74 percent higher than the $118,035,000 available in the budget which was adopted in October, 1952.

Although the fiscal year covered by the new budget does not begin until next July, some of the projects will be advertised for bids beginning in January. State law permits the awarding of contracts on or after April 1st, three months before the start of the fiscal year, so that full advantage may be taken of favorable construction weather.

Items in Budget

The state highway items in the budgets are as follows:

Major construction projects, $131,387,000; construction engineering, $14,000,000; rights of way, $59,723,000; maintenance, $25,000,000; preliminary engineering, $16,000,000; administration, $6,500,000; contingencies, $4,931,290; buildings and plants, $4,500,000; highway planning, $1,750,000; honor camps, $1,250,000; maintenance of the San Francisco-Oakland Bay Bridge, $1,200,000; minor improvement and betterment, $500,000; equipment, $500,000; and outdoor advertising, $75,000.

For nonstate highway functions included by law in the State Highway Budget, the following amounts are provided: gas tax apportionment to cities for improvement of city streets, $24,807,540; Federal Aid Secondary funds for county roads, $4,375,000; and $2,500,000 for county roads, to be used in matching federal aid funds apportioned to the counties. These items bring the grand total budgeted by the commission to $298,998,830.

Largest Single Allocation

The largest single allocation of the 180 items in the construction budget is $8,550,000 for the construction of 3.9 miles of the Ramona Freeway (US 70-99) through and near El Monte. The next largest is a $6,000,000 item for 4.7 miles of US 40 on its new freeway location through Richmond, El Cerrito, and San Pablo in Contra Costa County.

Other major projects in the 1954-55 budget include:

Alameda County, grading, paving, and structures on new 2.5-mile freeway connecting Eastshore Freeway near San Lorenzo with US 50 slightly east of Foothill Boulevard, $3,570,000.

Alameda County, grading, paving, and structures on 0.8 mile of Eastshore Freeway between Market and Eleventh Streets in Oakland, $2,414,000.

Eastshore Freeway

Alameda County, paving and structures on 1.6 miles of the Eastshore Freeway from south of University Avenue to El Cerrito Overhead, $3,110,000 (continuation of freeway widening project now under construction between the Oakland Distribution Structure and El Cerrito Overhead).

Calaveras County, widening of Sign Routes 12 and 49 through San Andreas, 1.7 miles, $350,000.

Colusa and Glenn Counties, widening of bridges and resurfacing of US 99-W between Maxwell and Willows, three projects totaling $765,000.

Contra Costa County, grading, paving, and structures on 4.7 miles of new US 40 freeway between 0.2 miles south of Jefferson Avenue in Richmond and County Road No. 24 east of San Pablo, $6,000,000.

Del Norte County, clearing, fencing, grading, and cattlepass construction on 6.2 miles of US 101 between the junction with US 199 and the Smith River Bridge, $835,000.

El Dorado County, grading and surfacing of new routing of US 50 between 2¼ miles east of Clarksville and Shingle Springs, 4.8 miles, $550,000.

Fresno Project

Fresno County, grading, paving, and structures on new route of US 99 between Teilman and Princeton Avenues in and north of the City of Fresno, $2,100,000.

Humboldt County, grading and structures on five miles of US 101 from north city limits of Eureka to Gannon Slough, $975,000 (when completed, will connect with Burns Freeway now nearing completion through Arcata).

Imperial County, California's share (50 percent) of a new bridge on US 80 over the Colorado River at Yuma, $800,000.

Kern, Inyo, and Mono Counties, grading and surfacing on US 395 in

various locations, four projects totaling 30.6 miles, $685,000.

Kern and Tulare Counties, grading, paving, and structures on US 99 between one mile south of the Delano Underpass and one-half mile north of the Tulare County line, 4.8 miles, $2,960,000 (extension of continuous multilane divided highway now stretching from north of San Fernando to just south of Delano).

Kings County, grading and surfacing seven miles of Central Valley Highway (State Highway Route 135) between Kansas Avenue and one mile north of Corcoran, $400,000.

Lake County, grading and surfacing of 1.5 miles of Sign Route 29 northerly from Napa County line, $350,000.

Southern Freeways

Los Angeles County, structures and approaches on 0.6 mile of the Santa Ana Freeway between Lyon Street and the junction with the Ramona Freeway, including widening of the Aliso Street Bridge over the Los Angeles River, $2,450,000.

Los Angeles County, grading, paving, and structures on Whittier Boulevard (US 101) for 3.7 miles between Painter Avenue and the Orange County line, $750,000.

Los Angeles County, grading, paving, and structures on approximately seven miles of the Ramona Freeway (US 70-99) between Rosemead Boulevard and Puente Avenue, two projects totaling $13,050,000 (continuation of the freeway easterly through and beyond El Monte, $8,550,000 from Rosemead Boulevard to San Gabriel River and $4,500,000 from Durfee Avenue to Puente Avenue, including bridges over the San Gabriel and Rio Hondo Rivers and many other structures).

Los Angeles County, structures on the route of the Sepulveda Freeway, between Waterford Street and Casiano Road in West Los Angeles, $800,000 (first construction on the Sepulveda Freeway).

Colorado Freeway

Los Angeles County, grading, paving, and structures on the Colorado Freeway from Patrician Way (west of new Pioneer Bridge over Arroyo Seco) to Eagle Vista Drive, 0.9 mile, $1,320,000.

Los Angeles County, grading, paving, and structures on three miles of the Harbor Freeway between Battery Street in San Pedro and just north of the Pacific Coast Highway, $4,650,000.

Los Angeles County, grading, paving, and structures on the Long Beach Freeway, two projects totaling one mile between Leonis Street and Verona Street, $4,050,000 (extending north and south from the overhead structure now being built over the railroad classification yards).

Los Angeles County, structures on the Santa Ana Freeway between Rosecrans Avenue and the Orange County line, $1,534,000 (to convert an expressway to a full freeway).

Marin County, new bridge over Richardson Bay on US 101, $3,000,000.

Marin County, paving of US 101 between Golden Gate Bridge and Manzanita (Waldo project now being graded), State's share, $790,000.

Mendocino County, surfacing of portions of US 101 between Sapp Creek and the Humboldt County line, two projects totaling $240,000.

Merced County

Merced County, grading, surfacing, and structures on Sign Route 152 for 4.9 miles between the junction of State Highway Route 121 and east of Highline Canal, $710,000.

Modoc County, grading and surfacing on US 299 for 8.2 miles between Canby and Chambers Ranch, $480,000.

Monterey County, grading, paving, and structures on 5.5 miles of the US 101 freeway in Salinas, $2,820,000 (grading and structures on a portion of this freeway now under construction).

Napa County, grading and surfacing of 2.6 miles on Sign Route 12-37 between 2.1 miles east of the Sonoma County line and 2.2 miles east of the Carneros School, $470,000.

Orange County, grading, paving, and structures on portions of the Santa Ana Freeway from Broadway in Santa Ana to the Los Angeles County line, totaling 2.7 miles, $3,828,000.

Orange County, grading, paving, and structures on Sign Route 14 for 4.5 miles on new location between Cypress Avenue and the Santa Ana Canyon Road, $1,200,000.

US 40 Project

Placer County, grading and surfacing of 2.6 miles of US 40 between one mile west of Applegate and Heather Glenn, $900,000.

Riverside County, structures on new route of US 60-70-99 in Banning, $280,000.

Riverside County, grading, surfacing, and structures on 14.5 miles of US 60-70-99 from 2.3 miles west of Garnet to Edom, $2,655,000.

Sacramento County, grading, surfacing, and structures on 5.2 miles of US 50-99 between one-half mile south of Elk Grove Road and 1.8 miles south of Florin Road, $1,000,000.

Sacramento County, grading, surfacing, and structure on the Elvas Freeway between C Street and Swanston Street, $1,130,000 (most of Elvas Freeway project completed or under construction).

San Bernardino County, structures on US 70-99 Freeway between one mile west of Colton and South E Street, $900,000.

San Diego County, grading, paving, and structures on two miles of Sign Route 94 on new freeway location between 0.6 mile east of Euclid Avenue and College Avenue, $1,900,000.

Bayshore Freeway

San Francisco-San Mateo Counties, grading and structures on Bayshore Freeway between just south of the San Francisco city limits and the Third Street Overcrossing now under construction, one mile, $850,000.

San Francisco County, grading, paving, and structures on Bayshore Freeway connection to San Francisco-Oakland Bay Bridge, between Fifth and Third Streets at Harrison, $1,360,000 (final unit of freeway-bridge connection project).

San Francisco County, grading, paving, and structures on first unit of Embarcadero, between Fourth Street and Broadway (portions), 1.5 miles, $5,000,000.

San Joaquin County, grading, paving, and structures on 4.6 miles of US 99 between Austin Road and slightly

Major Construction Projects in State Highway B

north of Lathrop Road, $1,700,000 (connecting with expressway now under construction between Austin Road and Ripon and providing bypass of Manteca business district).

US 50 Project

San Joaquin County, grading and paving of six miles of US 50 from Alameda County line to west city limits of Tracy, $1,500,000 (connecting with freeway now under construction in Alameda County).

San Luis Obispo County, grading, paving, and structures on 3.5 miles of US 101 between Arroyo Grande and Pismo Beach, $2,455,000.

San Luis Obispo County, paving of US 101 expressway between Paso Robles and San Miguel, 6.6 miles, $1,350,000 (grading and structures now under construction).

Santa Barbara County, paving of US 101 expressway between slightly east of Carpinteria and slightly east of Arroyo Parida, 3.4 miles, $1,020,000 (grading and structures now under construction).

Santa Barbara County, grading, paving, and structures on US 101 between one mile north of Nojoqui Summit and just south of the Santa Ynez River, 4.2 miles, $2,515,000.

Santa Clara County, grading, paving, and structures on Sign Routes 9 and 17 between one-half mile south of Los Gatos and Roberts Road, 2.4 miles, $2,263,000.

Shasta County, grading and surfacing on US 99 between Project City and Mountain Gate, 3.5 miles, $925,000.

Petaluma Bypass

Sonoma County, grading, paving, and structures on eight miles of US 101 between a mile south of Petaluma Creek and just south of Railroad Avenue (Cotati), $4,713,000.

Stanislaus County, grading, surfacing, and widening of bridge on US 99 for 1.8 miles south of Modesto, $700,000.

Tehama County, grading and surfacing on US 99-E for 12.2 miles, from Los Molinos to Mill Race Creek, $820,000.

Trinity County, grading, surfacing, and bridge on 2.5 miles of US 299 between 1.8 miles east of Weaverville and 2.3 miles west of Douglas City, $393,000.

US 99 Expressway

Tulare County, grading, paving, and structures for 7.2 miles of US 99 expressway from just north of Kern County line to just north of Earlimart, $2,500,000 (connecting with freeway project in Delano area immediately to the south).

Tulare County, grading, paving, and structures on 7.6 miles of Sign Route 65 between 1.5 miles north of Deer Creek and Linda Vista Avenue north of Porterville, $1,110,000.

Tuolumne County, grading, surfacing, and bridge on Sign Route 120 for 2.7 miles between Stevens Bar Bridge and Moccasin Creek Road, $500,000.

Ventura County, grading, paving, and structures on US 101 between just west of Central Avenue and the Santa Clara River, 5.1 miles, $1,943,000 (extension of Camarillo freeway project now under construction).

Yuba County, structures on new location of US 99-E on four-mile section between Olivehurst and Marysville, $475,000.

County	Route	Description	Approximage mileage	Estimated cost
Alameda	228, 5 (US 50)	Junction Route 69 (Eastshore Freeway) to 0.4 mile east of Foothill Boulevard; grade, pave and structures	2.5	$3,570,000
Alameda	5 (US 50)	Two miles east of Redmond Overhead to San Joaquin county line; pave (See San Joaquin County for continuation of project)	1.7	360,000
Alameda	69 (SR 17)	Eastshore Freeway, Market to Eleventh Street; grade, pave and structures	0.8	2,414,000
Alameda	69 (US 40)	Eastshore Freeway, South of University Avenue to El Cerrito Overhead; pave and structures	1.6	3,110,000
Alameda	107 (SR 21)	Hearst Ranch to Dublin (portions); surface	5.4	115,000
Alameda	227	Route 5 to Route 75 (Mountain Boulevard) (portions), Joint Highway District No. 26; grade and surface	9±	300,000
Alameda	Various	Rights of way on state highway routes		2,744,000
Alpine	24, 23 (SR 4, 89)	Centerville Bridge to Markleeville (portions); grade and surface	5.0	250,000
Alpine	24 (SR 4)	Jackass Gulch Bridge; redeck		30,000
Amador	97 (SR 88)	San Joaquin county line to west of Jackson Creek; grade and surface	2.0	250,000
Butte	Various	Rights of way on state highway routes		89,000
Calaveras	24, 65 (SR 12, 49)	Through San Andreas; grade and surface	1.7	350,000
Colusa-Glenn	(US 99W)	0.5 mile north of Williams to Wilson Creek; widen bridges		145,000
Colusa	7 (US 99W)	Maxwell to Glenn county line (portions); base and surface		320,000
Colusa	15 (SR 20)	Williams to Colusa (portions); base and surface	8.2	250,000
Colusa	Various	Rights of way on state highway routes		25,000
Contra Costa	69, 14 (US 40)	Eastshore Freeway, 0.2 mile south of Jefferson Avenue to south of County Road No. 24; grade, pave and structures	4.7	6,000,000
Contra Costa	75 (SR 4, 24)	0.2 mile west to 0.1 mile east of Hillcrest Road; grade and surface	0.3	50,000
Contra Costa	75 (SR 4, 24)	Two miles east of Antioch to 0.8 mile west of Oakley; surface	2.0	55,000
Contra Costa	106 (SR 4)	Alhambra Avenue intersection; grade and surface		100,000
Contra Costa	Various	Rights of way on state highway routes		1,471,000
Del Norte	1 (US 199)	At 27.1 miles northeasterly of Crescent City; grade and surface		50,000

get for 1954-55 Fiscal Year Total $131,387,000

County	Route	Description	Approximate mileage	Estimated cost
Del Norte	1, 71 (US 101)	Junction Route 1 to Smith River Bridge and Westbrook cattlepasses; clear, fence, grade, and cattlepasses	6.2	$836,000
Del Norte	Various	Rights of way on state highway routes		30,000
El Dorado	11 (US 50)	2¼ miles east of Clarksville to Shingle Springs; grade and surface	4.8	550,000
El Dorado	Various	Rights of way on state highway routes		225,000
Fresno	4 (US 99)	Selma to Fowler; surface	3.7	50,000
Fresno	4 (US 99)	Teilman Avenue to Princeton Avenue; grade, pave and structures		2,100,000
Fresno	Various	Rights of way on state highway routes		450,000
Glenn	7 (US 99W)	Colusa county line to Willows (portions); base and surface		300,000
Glenn-Colusa	7 (US 99W)	0.5 mile north of Williams to Wilson Creek; widen bridges		*145,000
Glenn	Various	Rights of way on state highway routes		65,000
Humboldt	1 (US 101)	Mendocino county line to Benbow; surface	7.4	75,000
Humboldt	1 (US 101)	Gannon Slough to 0.9 mile north of Plaza Avenue; highway illumination and traffic signals	2.9	65,000
Humboldt	1 (US 101)	North city limits of Eureka to Gannon Slough; grade and structures	5.0	975,000
Humboldt	1 (US 101)	Gannon Slough to north city limits of Arcata (portions); surface		15,000
Humboldt	20 (US 299)	Willow Creek to South Fork Trinity River Bridge (portions); base and dust oil		5,000
Humboldt	Various	Rights of way on state highway routes		300,000
Imperial	26 (US 99)	One mile west of Brawley to Trifolium Canal (portions); surface and shoulders	11.7	140,000
Imperial	27 (US 80)	Grays Well to Ogilby Road; surface	6.3	65,000
Imperial	27 (US 80)	Yuma Crossing of Colorado River; structure (California share)		800,000
Inyo	23 (US 6, 395)	Haiwee to 0.5 mile north of Cottonwood Creek; grade and surface	15.1	175,000
Inyo	Various	Rights of way on state highway routes		5,000
Kern	4 (US 99, 466)	Station 552 to Station 587 near Cawelo; grade and pave	0.7	115,000
Kern	4 (US 99, 466)	Cawelo to north end of Famoso Underpass; surface	7.2	400,000
Kern-Tulare	4 (US 99)	One mile south of Delano Underpass to 0.5 mile north of Tulare county line; grade, pave and structures	4.8	*2,960,000
Kern	23 (US 6)	At junction of Route 58 (SR 178); reconstruct intersection	0.5	30,000
Kern	23 (US 6)	Jawbone to Ittner's; grade and surface	3.9	260,000
Kern	57 (SR 178)	East city limits of Bakersfield to Horace Mann Avenue; surface and drainage	1.2	40,000
Kern	58 (SR 178)	In Bakersfield, I Street to Chester Avenue and N Street to Route 4; surface	0.5	20,000
Kern	58 (US 466)	Bena Cattlepass and Lomand Cattlepass; replace cattlepasses		30,000
Kern	138 (SR 33)	Mile 7.42 A to mile 8.9 B, between Maricopa and McKittrick, (portions), surface, shoulders and bridges	11.7	250,000
Kern	140 (US 399)	Sunset Railroad to Weed Creek (portions); grade and surface	2.6	250,000
Kern	142	Beardsley Avenue to 0.6 mile north of China Grade Loop; grade and surface	2.1	418,000
Kern	Various	Rights of way on state highway routes		319,500
Kings	125 (SR 41)	North Fork of Kinga River Overflow; culvert and fill		20,000
Kings	135	Kansas Avenue to one mile north of Corcoran; grade and surface	7.0	400,000
Kings	Various	Rights of way on state highway routes		1,000
Lake	49 (SR 29)	0.3 to 4.9 miles northerly of Napa-Lake county line (portions); grade and surface	1.5	350,000
Lake	89 (SR 29)	0.1 mile to 0.6 mile northerly of Cobb Post Office; grade and surface	0.5	80,000
Lake	Various	Rights of way on state highway routes		70,000
Los Angeles	2	Orange county line to Painter Avenue; grade, pave and structures	3.7	750,000
Los Angeles	2 (US 101)	Santa Ana Freeway-Ramona Freeway (Route 26) to Lyon Street; structures and approaches	0.6	2,450,000
Los Angeles	19, 77 (US 60)	At Pomona, 0.7 mile west of Route 77 to Hansen Avenue; grade, surface and structures	1.2	390,000
Los Angeles-San Bernardino	19 (US 60)	Los Angeles county line to Kadota Avenue; bridge and approaches	0.3	*85,000
Los Angeles	26 (US 60, 70, 99)	Ramona Freeway-Puente Avenue to Durfee Avenue; grade, pave and structures	3.4	4,500,000
Los Angeles	26 (US 60, 70, 99)	Ramona Freeway-San Gabriel River to Rosemead Boulevard; grade, pave and structures	3.9	8,550,000
Los Angeles	26 (US 70, 99)	Holt Avenue in Pomona, east city limits to Reservoir Avenue; subseal and surface	0.9	43,000
Los Angeles	59 (SR 138)	Route 4 (US 99) to Route 23 (US 6) (portions); grade and surface	5.5	336,000
Los Angeles-Orange	62 (SR 39)	Junction Route 171 (Huntington Beach Blvd.) to junction Route 176 (Imperial Highway); grade, surface and structures	3.0	*305,000
Los Angeles	77	Valley Boulevard-Ivar Street to east city limits of San Gabriel; grade and surface	0.7	138,000
Los Angeles	158 (SR 7)	Sepulveda Freeway-Waterford Street to Casiano Road; structures		800,000
Los Angeles	161 (US 66A, SR 134)	Colorado Boulevard and Freeway-Eagle Vista Drive to Patrician Way; grade, pave and structures	0.9	1,320,000
Los Angeles	164 (SR 107)	Route 60 (US 101 Alt.) to 190th Street (portions); grade, pave and structures	3.6	800,000
Los Angeles	165 (US 6, SR 11)	Harbor Freeway-Battery Street to 0.2 mile north of Route 60 (US 101 Alt.); grade, pave and structures	3.0	4,650,000
Los Angeles	167 (SR 15)	Los Angeles River Freeway-Sheila Street to Leonis Street; grade, pave and structures	0.3	965,000
Los Angeles	167 (SR 15)	Los Angeles River Freeway-Noakes Street to Verona Street; grade, pave and structures	0.7	3,085,000
Los Angeles	174 (SR 10)	Grevillea Avenue to Prairie Avenue; grade and surface	0.7	185,000
Los Angeles	174 (US 101)	Santa Ana Freeway-Rosecrans Avenue to Orange county line; structures		1,534,000
Los Angeles	Various	Rights of way on state highway routes		24,357,500
Madera	Various	Rights of way on state highway routes		300,000

County	Route	Description	Approximate mileage	Estimated cost
Marin	1 (US 101)	Golden Gate Bridge to Manzanita; pave (State Highway Fund share)	3.9	$790,000
Marin	1 (US 101)	Richardson Bay; bridge	1.0	3,000,000
Marin	8 (SR 37)	Ignacio to Black Point (portions); surface and widen 2 bridges	2.3	120,000
Marin	52	2.5 miles to 3.0 miles west of Belvedere; (portions); grade and surface	0.5	50,000
Marin	56 (SR 1)	Coyote Creek; bridge		50,000
Marin	Various	Rights of way on state highway routes		600,000
Mariposa	18 (SR 140)	9.3 miles to 6.3 miles west of Mariposa; grade and surface	3.0	200,000
Mariposa-Tuolumne	110 (SR 132)	Stanislaus county line to Coulterville (portions); grade and surface	5.0	25,000
Mendocino	1 (US 101)	Gobbi Street to Low Gap Road (portions); curbs and gutters		30,000
Mendocino	1 (US 101)	Sapp Creek to 3 miles south of Rattlesnake Summit; surface	2.0	125,000
Mendocino	1 (US 101)	Panther Springs to Humboldt county line (portions); surface		115,000
Mendocino	56 (SR 1)	Ross Creek; culvert and fill		50,000
Mendocino	Various	Rights of way on state highway routes		392,000
Merced	18 (SR 140)	Junction Route 4 (US 99) to easterly boundary (portions); surface	4.5	200,000
Merced	32 (SR 152)	West of junction Route 121 to east of Highline Canal; grade, surface and structures	4.9	710,000
Merced	32 (SR 33, 152)	0.1 mile east of Los Banos to the Dos Palos Wye (portions); surface	7.3	125,000
Merced	Various	Rights of way on state highway routes		125,000
Modoc	28 (US 299)	Canby to Chambers Ranch; grade and surface	8.2	480,000
Mono	23 (US 395)	½ mile north of McGee Creek Maintenance Station to Whitmore Tubs Road; grade and surface	1.3	50,000
Mono	23 (US 395)	Crestview to 2.0 miles south of Rush Creek; grade and surface	10.3	210,000
Monterey	2 (US 101)	Hartnell Road to East Market Street (Salinas); grade, pave and structures	5.5	2,820,000
Monterey	2 (US 101)	John Street (Salinas) to 0.4 mile north of Salinas Underpass (portions); surface	1.0	55,000
Monterey	56 (SR 1)	At Alder Creek; grade, surface and culvert	0.2	130,000
Monterey	56 (SR 1)	Torre Canyon; bridge and approaches	0.2	305,000
Monterey	117 (SR 1)	El Estero to Del Monte Junction; traffic signals and highway illumination	1.2	60,000
Monterey	Various	Rights of way on state highway routes		345,000
Napa	8 (SR 12, 37)	2.1 miles east of Sonoma county line to 2.2 miles east of Carneros School; grade and surface	2.6	470,000
Napa	Various	Rights of way on state highway routes		350,000
Nevada	37 (US 40)	West end Donner Lake to Junction Route 83 in Truckee; surface	5.9	100,000
Nevada	83 (SR 89)	Truckee to 2 miles north of Hobart Mills (portions); base and surface	4.9	80,000
Nevada	Various	Rights of way on state highway routes		350,000
Orange	2 (US 101)	Sixth Street in Tustin to Santa Ana Freeway at First Street; surface	1.5	40,000
Orange	2, 174 (US 101)	Santa Ana Freeway-Broadway to Los Angeles county line (portions); grade, pave and structures	2.7	3,828,000
Orange	60 (US 101 Alt)	South city limits to north city limits of Newport Beach; grade and surface	1.4	225,000
Orange-Los Angeles	62 (SR 39)	Junction Route 171 (Huntington Beach Blvd.) to Junction Route 176 (Imperial Highway); grade, surface and structures	3.0	305,000
Orange	175 (SR 14)	Cypress Avenue to junction Route 43 (SR 18); grade, pave and structures	4.5	1,200,000
Orange	Various	Rights of way on state highway routes		2,057,000
Placer	37 (US 40)	One mile west of Applegate to Heather Glen; grade and surface	2.6	900,000
Placer	Various	Rights of way on state highway routes		320,000
Plumas	21 (SR 24, 89)	4.1 miles east of Spring Garden to Deleker (portions); surface	10±	140,000
Plumas	Various	Rights of way on state highway routes		80,000
Riverside	26 (US 60, 70, 99)	22d Street in Banning to 0.5 mile east of Banning; structures		280,000
Riverside	26 (US 60, 70, 99)	2.3 miles west of Garnet to Edom; grade, surface and structures	14.5	2,655,000
Riverside	64 (SR 74)	Elsinore to Perris; surface	11.5	200,000
Riverside	64 (US 60, 70)	Range 9 east to Desert Center (portions); surface	10.3	100,000
Riverside	146 (US 95)	D Canal and C Canal; bridges and approaches		173,000
Riverside	187 (SR 111)	2.3 miles southeast of Thermal to junction Route 26 (US 99); surface	6.4	85,000
Riverside	Various	Rights of way on state highway routes		2,835,000
Sacramento	4 (US 50, 99)	½ mile south of Elk Grove Road to 1.8 miles south of Florin Road; grade, surface and structures	5.2	1,000,000
Sacramento	98	Elvas Freeway, C Street in Sacramento to Route 3 near Swanston Road; grade, surface and structure	2.8	1,130,000
Sacramento	Various	Rights of way on state highway routes		1,505,000
San Benito	119 (SR 25)	Tres Pinos Creek Bridge No. 43-17; bridge and approaches	0.7	175,000
San Benito	Various	Rights of way on state highway routes		140,000
San Bernardino-Los Angeles	19 (US 60)	Los Angeles county line to Kadota Avenue; bridge and approaches	0.3	85,000
San Bernardino	26 (US 70, 99)	Etiwanda Avenue and Archibald Avenue Interchanges; structures	0.8	670,000
San Bernardino	26 (US 70, 99)	One mile west of Colton to South E Street; structures		900,000
San Bernardino	31 (US 91, 466)	Junction Route 58 to Cronise Valley; shoulders	42.2	325,000
San Bernardino	43 (US 91, 395) (SR 18)	Eighth Street Underpass and approaches (State's share)	0.2	400,000
San Bernardino	43 (SR 18)	Route 190 to 0.5 mile north of 40th Street; surface	2.5	60,000
San Bernardino	58 (US 66)	Eight miles west of Ludlow to Amboy (portions); surface and shoulders	18.0	300,000
San Bernardino	145 (US 395)	Eight miles to 3.2 miles south of Route 58; grade and surface (State's share)	4.8	200,000
San Bernardino	192	Euclid Avenue, Eucalyptus Avenue to junction Route 190 (Baseline Road) (portions); surface (State's share)	8.4	163,000
San Bernardino	Various	Rights of way on state highway routes		3,050,000
San Diego	2 (US 101)	L Street Overcrossing; grade, pave and structure		235,000
San Diego	2 (US 101)	Camp Pendleton main entrance; grade, surface and structure		360,000
San Diego	196 (SR 78)	3.7 miles east of junction Route 2 to Vista; grade and surface	3.0	650,000

County	Route	Description	Approximate mileage	Estimated cost
San Diego	199 (SR 75)	Junction Route 2 to Coronado Heights (portions); grade and surface	1.4	$430,000
San Diego	200 (SR 94)	0.6 mile east of Euclid Avenue to College Avenue; grade, pave and structures	2.0	1,900,000
San Diego	Various	Rights of way on state highway routes		2,085,000
San Francisco	56 (SR 1)	Funston Tunnel; illumination		120,000
San Francisco-San Mateo	68 (US 101 Bypass)	Bayshore Freeway, 0.1 mile south of south city limits of San Francisco to Third Street Overcrossing; grade and structures	1.0	850,000
San Francisco	68 (US 40, 50)	Fifth Street to Third Street at Harrison; grade, pave and structures	0.2	1,360,000
San Francisco	224	Embarcadero, San Francisco-Oakland Bay Bridge at Fourth Street to Broadway (portions); grade, pave and structures	1.5	5,000,000
San Francisco	Various	Rights of way on state highway routes		6,800,000
San Joaquin	4 (US 99)	Austin Road to 0.5 mile north of Lathrop Road; grade, pave and structures	4.6	1,700,000
San Joaquin	5 (US 50)	Alameda county line to west city limits of Tracy; grade and pave (See Alameda County for portion of project)	6.0	1,500,000
San Joaquin	5 (US 50)	Paradise Cut Bridge to San Joaquin River (portions); grade, surface and frontage roads	1.0	30,000
San Joaquin	75 (SR 4)	Holt to San Joaquin River (portions); grade and surface	1.8	100,000
San Joaquin	75 (SR 4)	McDougal Canal to French Camp Turnpike; grade and surface	0.5	140,000
San Joaquin	75 (SR 4)	Junction Route 5 (US 50) to Junction Route 4 (US 99) on Mariposa Road; surface	1.3	85,000
San Joaquin	97 (SR 88)	Junction Route 4 (US 99) to Junction Route 24 (SR 12) south of Lockeford (portions); surface	4.7	60,000
San Joaquin	Various	Rights of way on state highway routes		765,000
San Luis Obispo	2 (US 101)	Arroyo Grande to Pismo Beach; grade, pave and structures	3.5	2,455,000
San Luis Obispo	2 (US 101)	Villa Creek to junction Route 56; surface	0.7	35,000
San Luis Obispo	2 (US 101)	Pismo Beach to Marsh Street in San Luis Obispo (portions); surface		200,000
San Luis Obispo	2 (US 101)	Marsh Street in San Luis Obispo to San Luis Obispo Creek; highway lighting	2.3	60,000
San Luis Obispo	2 (US 101)	Yerba Buena Creek; grade, surface and culvert	0.2	50,000
San Luis Obispo	2 (US 101)	Paso Robles to San Miguel; pave	6.6	1,350,000
San Luis Obispo-Santa Barbara	56 (SR 1)	Santa Maria River; bridge and approaches	0.7	*740,000
San Luis Obispo	Various	Rights of way on state highway routes		555,000
San Mateo	55 (SR 5)	0.2 mile south of junction Route 56 (SR 1) at Thornton to San Francisco county line; grade, surface and structure	0.7	400,000
San Mateo	56, 105 (SR 1)	0.2 mile north of Canada Verde Creek to Frenchman's Creek; Joint Highway District No. 9; grade, surface and structure	4.2	540,000
San Mateo-San Francisco	68 (US 101 Bypass)	Bayshore Freeway, 0.1 mile south of south city limits of San Francisco to Third Street Overcrossing; grade and structures	1.0	*850,000
San Mateo	68 (US 101 Bypass)	Bayshore Freeway, north city limits of Redwood City to Bransten Road; surface	0.8	40,000
San Mateo	Various	Rights of way on state highway routes		340,000
Santa Barbara	2 (US 101)	One mile east of Carpinteria to ½ mile east of Arroyo Parida; pave	3.4	1,020,000
Santa Barbara	2 (US 101)	One mile east of Orella to one mile west of Refugio; surface	2.8	100,000
Santa Barbara	2 (US 101)	One mile north of Summit to ½ mile south of Santa Ynez River; grade, pave and structures	4.2	2,515,000
Santa Barbara	56, 149 (SR 1, 150)	Route 149 (SR 150) to north city limits of Lompoc and west city limits to east city limits of Lompoc; surface	3.0	110,000
Santa Barbara-San Luis Obispo	56 (SR 1)	Santa Maria River; bridge and approaches	0.7	740,000
Santa Barbara	149 (SR 150)	Buellton to Route 80 (San Marcos Pass Road) (portions); grade, surface and structures (State's share)	2.9	355,000
Santa Barbara	Various	Rights of way on state highway routes		995,000
Santa Clara	2 (US 101)	0.1 mile south of south city limits of Gilroy to north city limits of Gilroy; grade, surface and widen bridge	1.5	215,000
Santa Clara	5, 42 (SR 17)	0.5 mile south of Los Gatos to Roberts Road; grade, pave and structures	2.4	2,263,000
Santa Clara	Various	Rights of way on state highway routes		875,000
Santa Cruz	Various	Rights of way on state highway routes		600,000
Shasta	3 (S 99)	Sulphur Creek to Project City; surface	5.0	750,000
Shasta	3 (S 99)	Project City to Mountain Gate; grade and surface	3.5	925,000
Shasta	20 (SR 44)	Clover Creek; bridge and approaches		100,000
Shasta	29 (SR 36)	Middle Fork Cottonwood Creek; bridge and approaches		30,000
Shasta	Various	Rights of way on state highway routes		420,000
Sierra	25, 83 (SR 49, 89)	Bassetts to junction Route 83 (SR 89) and six miles north of Nevada county line to 3.5 miles north of Sattley (portions); grade and surface		200,000
Sierra	Various	Rights of way on state highway routes		23,000
Siskiyou	72 (US 97)	0.8 mile east of Horse Thief Creek to Macdoel; surface	10.9	150,000
Siskiyou	72 (US 97)	Dorris to Oregon state line; grade and surface	2.9	250,000
Siskiyou	Various	Rights of way on state highway routes		77,000
Solano	7 (US 40)	Tennessee Street to Route 208; surface	1.7	90,000
Solano	7 (US 40)	Octo Inn (West of Fairfield); drainage correction		50,000
Solano	74 (SR 29)	Vallejo Wye to Vallejo; grade and surface	1.0	150,000
Solano	Various	Rights of way on state highway routes		150,000
Sonoma	1 (US 101)	1.1 miles aouth of Petaluma Creek to 0.5 mile south of Railroad Avenue; grade, pave and structures	8.0	4,713,000

County	Route	Description	Approximage mileage	Estimated cost
Sonoma	1 (US 101)	Wilfred Crossing to Santa Rosa and Russian River to Northwestern Pacific Railroad in Healdsburg and 0.1 mile south of south city limits to north city limits of Cloverdale; surface and shoulder improvement	5.6	$215,000
Sonoma	56 (SR 1)	Kolmer Gulch, Miller Creek, and Deadman Gulch; replace culverts		80,000
Sonoma	Various	Rights of way on state highway routes		372,000
Stanislaus	4 (US 99)	0.6 mile aouth of Turlock to 0.8 mile north of Turlock (portions); grade and surface	0.6	60,000
Stanislaus	4 (US 99)	Keyes to 0.5 mile south of Ceres and 2.0 miles north of Modesto to San Joaquin county line (portions); grade and surface		75,000
Stanislaus	4 (US 99)	Hatch crossing to Modesto; grade, surface and widen bridge	1.8	700,000
Stanislaus	13 (SR 120)	Oakdale to Tuolumne county line (portions); grade and surface	5.5	125,000
Stanislaus	41 (SR 33)	Railroad grade crossings south of Westley and north of Patterson and Puerto Creek Bridge; grade, surface and widen bridge		60,000
Stanislaus	41 (SR 33)	Main Canal, Orestimba Creek, and Timba Cattlepass, bridges and approaches		145,000
Stanislaus	66 (SR 120)	San Joaquin county line to Oakdale (portions); grade and surface	3.5	300,000
Stanislaus	109	M.I.D. Canal Lateral No. 3, bridge; widen		50,000
Stanislaus	Various	Rights of way on state highway routes		415,000
Sutter	Various	Rights of way on state highway routes		10,000
Tehama	3 (US 99E)	Los Molinos to Mill Race Creek; grade and surface	12.2	820,000
Tehama	29 (SR 36)	Tedoc Road to Button Canyon; grade and surface (State's share)	5.0	110,000
Tehama	Various	Rights of way on state highway routes		20,000
Trinity	20 (US 299)	Humboldt county line to Prairie Creek (portions); base and dust oil		65,000
Trinity	20 (US 299)	1.8 miles east of Weaverville to 2.3 miles west of Douglas City; grade, surface and bridge	2.5	393,000
Trinity	Various	Rights of way on state highway routes		5,000
Tulare-Kern	4 (US 99)	One mile south of Delano Underpass to 0.5 mile north of Tulare county line; grade, pave and structures	4.8	2,960,000
Tulare	4 (US 99)	0.5 mile north of Kern county line to 0.5 mile north of Earlimart; grade, pave and structures	7.2	2,500,000
Tulare	4, 10 (US 99, SR 198)	Visalia Airport Interchange; grade, pave and illumination	0.3	750,000
Tulare	4 (US 99)	0.5 mile south of Kings River to Clark Avenue; surface	1.3	55,000
Tulare	129 (SR 65)	1.5 milea north of Deer Creek to Linda Vista Avenue; grade, pave and structures	7.6	1,110,000
Tulare	Various	Rights of way on state highway routes		995,000
Tuolumne	40 (SR 49)	Stevens Bar Bridge to Moccasin Creek Road; grade, surface and bridge	2.7	500,000
Tuolumne-Mariposa	110 (SR 132)	Stanislaus county line to Coulterville (portions); grade and surface	5.0	*25,000
Tuolumne	Various	Rights of way on state highway routes		5,000
Ventura	2 (US 101)	0.4 mile west of Central Avenue to Santa Clara River; grade, pave and structures	5.1	1,943,000
Ventura	Various	Rights of way on state highway routes		1,440,000
Yolo	50 (SR 16)	Rumsey to three miles north; grade and surface	3.0	150,000
Yolo	90	2¾ miles north of Madison to 6.5 miles north of Madison; grade, surface and structures	3.7	464,000
Yolo	Various	Rights of way on state highway routes		25,000
Yuba	3 (US 99E)	Olivehurst to Marysville; structures	4.0	475,000
Yuba	Various	Rights of way on state highway routes		150,000

Ridgewood Project

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dation or subsidence of the underlying foundation, to consolidation of the materials placed in the embankment, or to some combination of these factors.

Settlement Platforms

In an effort to determine whether such settlement occurs within the roadway embankment or in its foundation on this project, settlement platforms are being installed at various locations to provide a means of accurately checking settlement, if any, at various levels within the embankment and its underlying foundation. It is hoped that the information obtained from this data will be of value in design studies to minimize roadway embankment settlement.

The settlement platform devices being installed to record settlement consist essentially of an inverted siphon of copper tubing with one end installed in the embankment or underlying foundation at the point chosen to determine settlement and the other end positioned outside the limits of construction at about the same elevation where recordings may be taken. Recordings are taken by filling the inverted siphon with water and noting the elevation of the water. An overflow into pervious material is provided when installing the settlement platform in the embankment. Installation of these embankment settlement platforms is being supervised by W. S. Maxwell of the Materials and Research Department in Sacramento.

It is estimated that all work will be completed on the subject grading project early in 1954. Current estimates are that the completed contract will involve the expenditure of approximately $1,060,000.

McCammon-Wunderlich of Palo Alto is the contractor. The firm is represented on the job by Superintendent James Wilson. The work is being supervised for the State by District Engineer Alan S. Hart and Resident Engineer Harold M. Hansen.

INTERSECTIONS ARE DANGEROUS

Intersections are places of danger for the motorist, points out the Public Safety Department of the National Automobile Club. All kinds of unexpected things can take place there and that is why the motorist should approach them with caution and drive through them with alert care.

Tunnel Illumination

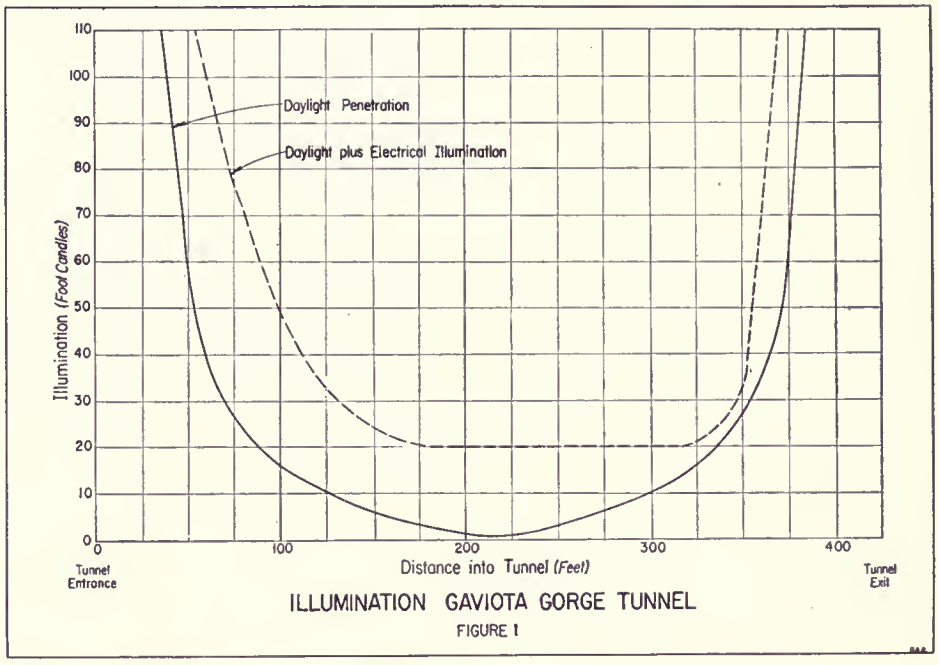
Gaviota Gorge Project Develops New Ideas

By ROY MATTHEWS, Senior Electrical Engineer

The Gaviota Gorge Tunnel on US Route 101, about 30 miles north of Santa Barbara, was recently opened to traffic.

The lighting within a tunnel, particularly during daylight hours, always poses a problem for the engineer. Very careful consideration must be given to the lighting contrast and driver reaction to the change from sometimes brilliant open highway conditions to artificial lighting which must be supplied within any tunnel of considerable length.

The Gaviota Tunnel is over 400 feet long. The terrain in the vicinity of the tunnel imposed controls on grade and alignment. Because of the 1,200-foot radius horizontal curve, an entering vehicle cannot see entirely through the tube. The 4.47 percent grade means that heavy vehicles will



ILLUMINATION GAVIOTA GORGE TUNNEL

FIGURE 1

Tunnel lighting from south face of bore



be moving at reduced speeds. Although traffic will be in one direction only, northbound, adequate protection must be accorded the lighter vehicles overtaking slower moving heavy vehicles.

Slimline Fluorescent Lamps

Slimline fluorescent lamps were chosen as the illuminant because of their long life, low power consumption, ease of maintenance and high light output. One row of an industrial type fixture of three 96-inch slimline fluorescent lamps is provided throughout the length of the tunnel.

Since the human eye takes considerable time to adapt itself from a brightly lighted area, such as natural daylight of 5,000 to 10,000 footcandles, to a dark area of only a few footcandles, such as the inside of a tunnel, additional illumination is needed just inside the entering tunnel portal during the daylight hours. Daytime entrance lighting is provided in the Gaviota Gorge Tunnel by means of two

. . . Continued on page 59

Sign Route 49 Out of Auburn Has New Look

Completion of the widening and straightening of State Sign Route 49, on the river grade between Auburn and the American River Bridge in Placer County, cleared the way for removing the ordinance, passed by the Placer County Board of Supervisors two years ago, which prohibited truck travel over this section of road for two hours each day while school busses were transporting students over the road to school in Auburn. This ordinance was enacted following two school bus-truck accidents on the grade in September of 1951.

To mark the removal of the ordinance on September 30th, a ceremony was arranged by the Auburn Area and Placer County Chambers of Commerce which had spearheaded the request for improvements on this portion of the road. Following a luncheon at the Hotel Auburn, an inspection was made of the widened road and the ordinance signs were torn down personally by members of the Placer County Board of Supervisors.

Among those attending the ceremonies were A. M. Nash, District Highway Engineer, and Perry Lowden, Supervising Engineer, both from District III, Division of Highways, Marysville; State Senators Harold Johnson of Roseville and Stephen Teale of Calaveras; Archie Stevenot, President of the Mother Lode Highway Association, Sonora; Fred Dunow, Deputy State Forest Ranger, Sacramento; Mayor Roy Mikkelsen of Auburn; members of the Placer County Board of Supervisors; and representatives of the Golden Chain Council, Placer Union High School, industrial and commercial users of the road, and representatives of the two chambers.



UPPER—River grade on Sign Route 49 just above American River as it looked in October, 1951, prior to widening. LOWER—Highway at some point in September, 1953. Shown at left are Senators Harold T. Johnson and Stephen Teale, and Pat Train, President, Auburn Area Chamber of Commerce.

There have been 905 fires on the San Francisco-Oakland Bay Bridge since it was opened to traffic in 1936, which averages out to more than four a month.

California's basic speed law requires a speed which is reasonable and prudent in view of traffic, weather and road conditions and in no case endangers the safety of property or persons. Almost one-third of all arrests are for excessive speed, a major factor in the highway death and injury toll.

ANOTHER UNIT OF BAYSHORE FREEWAY IS OPENED

On October 1, Director of Public Works Frank B. Durkee joined with Mayor Elmer Robinson of San Francisco in severing with a blow torch a chain stretched across the Bayshore Freeway, signalizing the opening of a new two-mile section of the freeway between Army and Bryant Streets in the Bay city.

The upper photo is an aerial view looking northeasterly across San Francisco. The 18th Street pedestrian overcrossing over the Bayshore Freeway in center foreground. Ninth and Tenth Street connections at left. San Francisco-Oakland Bay Bridge, Yerba Buena Island and man-made Treasure Island in upper right.



The lower picture shows Durkee, right, with Mayor Robinson on the left, cutting the ceremonial chain.

BELATED SAFETY CURES

Those who disregard health rules contract serious ailments and suddenly become desperately aware of the need for a cure. Drivers who disregard safety rules sooner or later become involved in serious accidents and then suddenly become desperately aware of the necessity of traffic safety rules and practices.

Secret Valley

Another Link Completed On U. S. Route 395

With the completion of the current contract covering two miles of highway on U. S. 395 north of Secret Valley in Lassen County one more link in the improvement of the highway south of Alturas to Susanville, eastern Lassen County and Reno, has been accomplished.

This is known as the Three Flags Highway.

This entire section, running from near Johnsonville some five miles east of Susanville to Alturas, was taken into the State Highway System in 1933.

Prior to that time it had been a county road maintained by Modoc and Lassen Counties.

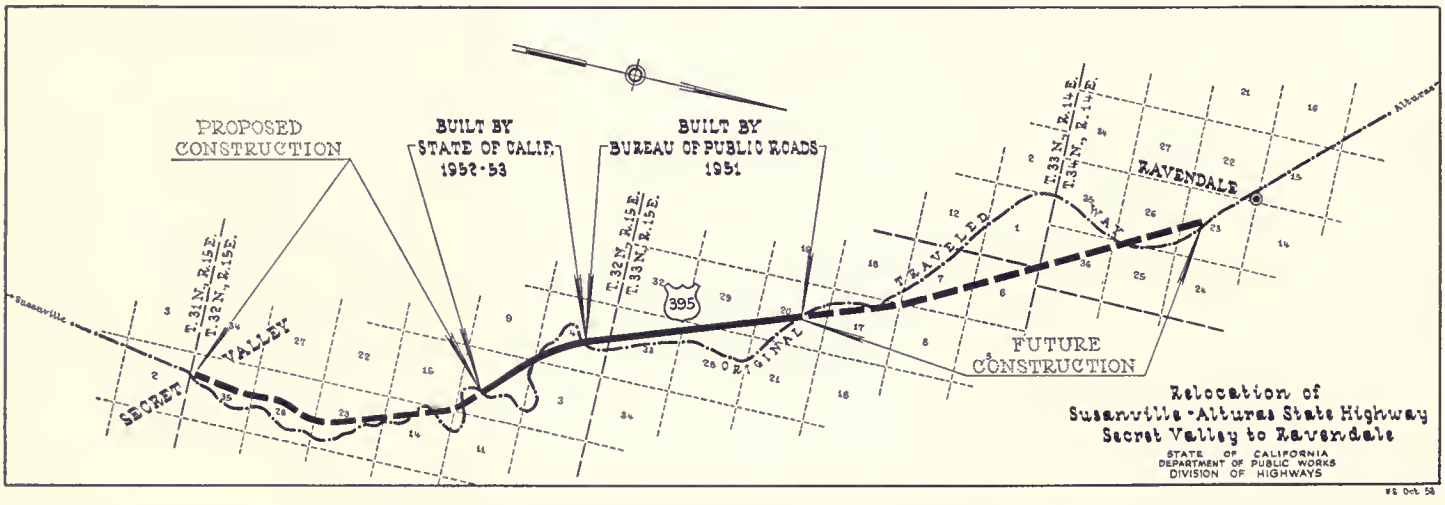
Maintenance Was Costly

Maintenance was hard and costly. The area is semidesert. The terrain is not particularly rough but every hill is likely to be solid lava. Several dry lake beds that had to be crossed are adobe and the flats between are covered with small lava boulders. All in all, it was hard to accomplish any showing with the limited funds available.

After the section was taken into the state system, some improvement has been made as funds became available. The Federal Government made some money available for construction



Type of new construction on Secret Valley section of US 395



through public lands. From this source a project covering two sections north of Madeline each of about two miles in length and passing through public lands were constructed. They were completed in 1939 at a cost of $77,698.

Other minor improvements were made from time to time as funds could be allotted.

Worst Section

Finally the worst section of the route was the portion south of Ravendale in Lassen County. In order to improve any part of this it was necessary to make a study of the whole section. Only by this means was it possible to be sure that any improvement would fit into the completed plan.

Accordingly, the Division of Highways completed a survey covering this section, 16.7 miles in length, from Ravendale to the improved highway at the south end of Secret Valley in 1946.

Using this location, the Bureau of Public Roads, awarded a contract to Harms Bros. in 1949 for $306,506 and constructed three miles. This section began about six and three-quarters miles north of the south end of survey and extended three miles north.

In January, 1952, the Division of Highways awarded a contract to A. Teichert & Sons, Inc., for extending construction of two miles further south. This is the contract just completed at a cost of $332,266.

Tough Construction

The grading and structures were practically completed in 1952. Surfacing was placed on the mile on the north end. It was too cold to mix and lay the road-mix surface on the south mile. That has just been completed, but was delayed by a late spring and a strike of about a month duration.

Highway construction in this area is tough. Most excavation is lava. It drills hard, is hard to shatter, and breaks coarse and blocky. Any soil encountered is adobe and must be kept generally 18 inches below finish grade. Fortunately, there is a good deposit of material suitable to place over native material and under the base.

Following the enactment of Assembly Bill No. 1237 in June of this year, the Highway Commission adopted an amended budget. From the increased funds made available by the increase in gas tax and other levies they allotted money for the improvement of the balance of the four and two-thirds miles still remaining on the south end of this section. Bids were opened on October 28th, and a contract for $491,161.50 awarded to Harms Bros., Sacramento.

When this is completed the southerly nine and three-quarters miles of this section will have been improved.

A. Teichert and Sons, Inc., was the contractor on the section just completed. J. W. Trask is district engineer at Redding and Ellis Engle was resident engineer on all the work, except surfacing of the southern mile. Bob Felton was in charge of this portion.



Type of construction replaced. Note that road reappears in the upper right corner.

CHAMBER OF COMMERCE PLEASED

GARBERVILLE CHAMBER OF COMMERCE
Garberville, Humboldt County, California

October 31, 1953

Mr. George T. McCoy,
State Highway Engineer,
Sacramento, Calif.

Dear Mr. McCoy: The Garberville Chamber of Commerce wishes you to know that we appreciate the work that was and is being done in the way of resurfacing in this area.

As we do not anticipate any great improvements in highway construction for some time, we are particularly grateful for and pleased with the type of resurfacing done in the area.

Thanking you again, we remain,

H. E. Tucker, *President*
Garberville Chamber of
Commerce

Dunsmuir Freeway

New Routing for U. S. 99 in Shasta and Siskiyou Proposed

A PRELIMINARY step toward the proposed construction of a freeway through the Dunsmuir area of the Sacramento River Canyon has been taken by the California Highway Commission.

The commission announced its intention to consider adopting a new routing for a 7.3-mile portion of U. S. Highway 99 between one-half mile south of Castella, Shasta County, and the north city limits of Dunsmuir in Siskiyou County. If adopted, the section would be declared a freeway.

Between south of Castella and the Shasta-Siskiyou county line, the proposed new routing follows the general location of the existing highway and the Southern Pacific Railroad tracks along the west side of the Sacramento River. It is a new line which provides easier grades and eliminates many of the sharper curves.

Major Relocation

From the Shasta-Siskiyou county line at Little Castle Creek northward to the Sacramento River crossing at Dunsmuir, the proposed new routing would be a major relocation, roughly paralleling the existing highway and skirting the business district of Dunsmuir on the so-called "high line" to the west. It enters the city near Daly Street and passes between the Dunsmuir High School and Castle Avenue, continuing west of Castle Avenue to rejoin the existing highway at the Sacramento River Bridge. At this point it would connect with the current 4.3-mile project under construction between Dunsmuir and Big Canyon.

Plans of the Division of Highways call for future construction as a four-lane divided freeway, with separation structures at major intersections, including a pedestrian crossing near the Dunsmuir high school.

State engineers estimate the costs at approximately $4,700,000, including rights of way, but start of construction would be dependent on the availability of future highway funds.

The new routing under consideration was recommended by the Division of Highways as the most feasible and the one which would best serve both local and through traffic. The existing route through Dunsmuir over Florence Avenue is winding and narrow, and engineering studies found it to be unsuitable for development to freeway standards because of disruption to existing commercial development and prohibitive right-of-way costs.

THOUGHTS ABOUT HIGHWAYS AT CHRISTMAS TIME

"In the wilderness prepare the way of the Lord,
Make straight in the desert a highway for our God.
Every valley shall be lifted up, and every mountain and hill be made low;
The uneven ground shall become level, and the rough places a plain."
Isaiah 40:3-4

"I will make all my mountains a way, and my highways shall be raised up."
Isaiah 49:11

"Prepare the way for the people; build up the highway, clear it of stones."
Isaiah 62:10

"Set up waymarks for yourself, make yourself guideposts;
Consider well the highway, the road by which you went."
Jeremiah 31:21

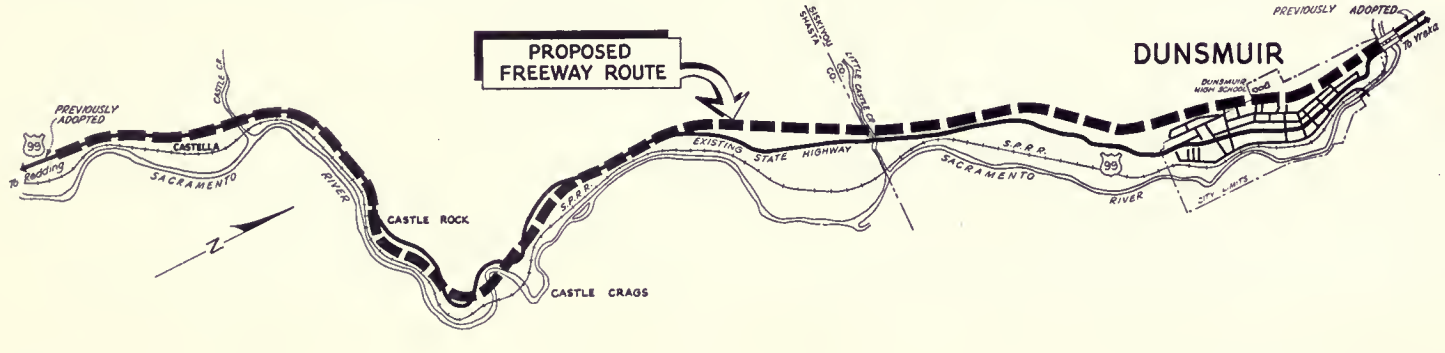
"There will be a highway from Egypt to Assyria, and the Assyrian will come into Egypt, and the Egyptian into Assyria."
Isaiah 19:23

"And a highway shall be there, and it shall be called the Holy Way;
The unclean shall not pass over it, and fools shall not err therein.
No lion shall be there, nor shall any ravenous beast come up on it;
They shall not be found there, but the redeemed shall walk there."
Isaiah 35:8-9

Submitted by
MRS. A. VAN BOOEN
Junior Civil Engineer
District XIV

SAFETY BEGINS AT HOME

The first 25 miles away from home are the most hazardous when you're driving an automobile, says the California State Automobile Association. Statistics show that 61 percent of the drivers involved in the 33,000 fatal accidents during 1952 lived within 25 miles of where the accident occurred. In short, safety should begin at home.



Sacramento Again Enjoys the Annual Gem and Mineral Show

By GEORGE F. WINSLOW, Associate Highway Engineer

An occasion of considerable interest in Sacramento November 7th-8th was the annual Gem and Mineral Show of the Sacramento Mineral Society. A beautiful array of material from the common rock to the highly polished stones and faceted gems pleased the eye of everyone who visited the show.

Governor Goodwin J. Knight, who has considerable background with minerals, was invited to open the show but due to other commitments was unable to attend. A group of the society members met with the Governor before the show, at which time a beautifully polished specimen of California Nephrite Jade, obtained from the Monterey County coast, was presented to him. Among the many activities of the Governor are: A year in the lead and zinc mines of Southern Nevada, following high school; vacation work as a hard-rock miner, while in college; and owning and operating a gold mine in Kern County.

On February 29, 1936, a group of state employees, with a few others, organized what is now the Sacramento Mineral Society. Allan Nicol of the

. . . Continued on page 63



Members of Sacramento Mineral Society present Governor Knight with gem from show. LEFT TO RIGHT— Hal Altman, Elmer Lester, Governor Knight, Geo. Winslow, President of Society, and Perry Baker.

View of exhibits at gem and mineral show



In Costa Mesa

Newly Incorporated City Gets Big Freeway Project

By J. L. NEEDHAM, Resident Engineer

FRANK B. DURKEE, Director of the State Department of Public Works, on October 2, 1953, announced the acceptance in the name of the State of a contract covering completed construction of a six-lane limited access freeway through the recently incorporated City of Costa Mesa in Orange County. The community of Costa Mesa in the County of Orange adjoining to the north the City of Newport Beach has been growing steadily particularly since the war years. The estimated census at the time of incorporation as a city on June 29, 1953, was 16,185 persons. The people elected as their first mayor, Charles T. Tewinkle. Councilmen that were elected are: Claire Nelson, Walter Miller, Bruce Martin and Bert Smith. The City of Costa Mesa at the time of incorporation approved the city manager type of government and George W. Coffey was appointed as city manager.

Limited Access Freeway

On November 3, 1952, construction of another link in the conversion of State Highway Route 43 to a limited access freeway was started. This contract provided for reconstructing two miles of existing Newport Boulevard to provide a six-lane divided highway from a point just northerly of State Highway Route 60 (Coast Boulevard) in Newport Beach to 20th Street in Costa Mesa. Construction from State Highway Route 60 to 17th Street is on new alignment through a former canyon utilizing an abandoned Southern Pacific Railroad right of way. From 17th Street to 20th Street in the City of Costa Mesa the existing Newport Boulevard was utilized as the northbound roadway of the divided highway and a new southbound roadway was constructed on the west. Frontage roads were constructed to facilitate flow of local traffic and to provide access to business establishments.

The work done consisted of constructing a graded roadbed for a six-lane divided highway and paving with four inches of plant-mixed surfacing on eight inches of imported cement-treated base over imported subbase material and select material.

Drainage Channel

The small canyon from Route 60 to 17th Street serves as a drainage channel for the surrounding area and receives quite a concentration of storm waters in a relatively short time. It was found that subsurface drainage on an impervious underground strata was also concentrated in this gully.

Looking northerly along completed six-lane limited access freeway approaching business district of Costa Mesa





Looking southerly along freeway from south end of business district of Costa Mesa

This caused some difficulty during construction as it was impossible for equipment to operate over the natural ground from 15th Street to 17th Street for a period of about six weeks.

In order to provide adequately for drainage throughout the project it was necessary to construct approximately 8,000 lineal feet of reinforced concrete pipe drains of varying sizes; 890 lineal feet of a 5-foot x 4-foot reinforced concrete box culvert; 1,200 lineal feet of reinforced concrete ditch; 6,000 lineal feet of plant-mixed and pneumatically applied mortar lined ditches; and 4,000 lineal feet of earth ditches, with required inlet and outlet structures.

Cut Slopes Stabilized

Restricted right of way in the vicinity of the Hoag Memorial Hospital and in the rear of business properties from Route 60 to 15th Street required the use of 1:1 and 1½:1 cut slopes. Due to the sandy nature of the soil encountered in this area it was considered advisable to stabilize all the cut slopes. Type "A" slope stabilization, consisting of wooden frames filled with topsoil and covered with straw and wire mesh, was placed on all 1:1 slopes. Type "B" slope stabilization, consisting of straw and wire mesh, was placed on all 1½:1 slopes. Both types of stabilization and all median strips were planted with ice plant (*Mesembryanthemum edule*) cuttings.

The community of Costa Mesa which incorporated as a city during the construction period was using the existing right of way from 18th Street to Broadway Avenue as a parking area. Local civic organizations were concerned over the loss of this facility due to the new highway construction. The problem was considered in the highway design and provisions were made to permit parking on shoulder areas of the divided highway and on the frontage road from 17th Street to 19th Street.

Landscaping

Ornamental palm trees had been planted and maintained in the parkway area in the center of the highway from 17th Street to Broadway Avenue and the community of Costa Mesa requested that the existing type of landscaping be preserved under the new construction. Under a previous contract 85 existing Cocos Plumosa and Washingtonia Robusta palm trees were selected and moved to a storage area between 20th Street and Bay Street. These trees were replanted in the median strip between the highway and the frontage road on the left from 17th Street to 19th Street under the present contract. It is of interest to note that of the 85 palm trees originally selected, 83 successfully withstood the double transplanting in less than a year's time.

The contract work for construction on this two-mile section of highway amounted to $713,220. Sully-Miller Contracting Company was the contractor with E. L. White as superintendent.

MAYOR PAYS COMPLIMENT

The completion of the freeway through the business district of the City of Costa Mesa is a real tribute to those involved in the development and planning of this section of the highway.

We of Costa Mesa are particularly proud of the landscaping of those areas adjacent to the freeway and feel that it is a good job well done.

CHARLES W. TEWINKLE
Mayor

Cost Index

California Highway Construction Costs Stationary Through Third Quarter, 1953

By RICHARD H. WILSON, Assistant State Highway Engineer
H. C. McCARTY, Office Engineer
JOHN D. GALLAGHER, Assistant Office Engineer

DURING the third quarter of 1953 the California Highway Construction Cost Index rose only two-tenths of 1 percent over the second quarter of 1953, indicating that over-all construction costs on state highway contracts continued to remain at approximately the same level as for the two previous quarters.

The index for the third quarter of the year was 218.0 (1940 = 100) as compared to 217.5 for the second quarter and 218.3 for the first quarter. This third quarter index figure of 218.0 is 27.4 index points, or 11.2 percent, under the 245.4 for the fourth quarter of 1951, which was the quarter of highest construction costs as reflected by the Index. It also is 58.0 points, or 36.3 percent, over the 160 of the first quarter of 1950, which was the low dip in prices prior to the beginning of the Korean War.

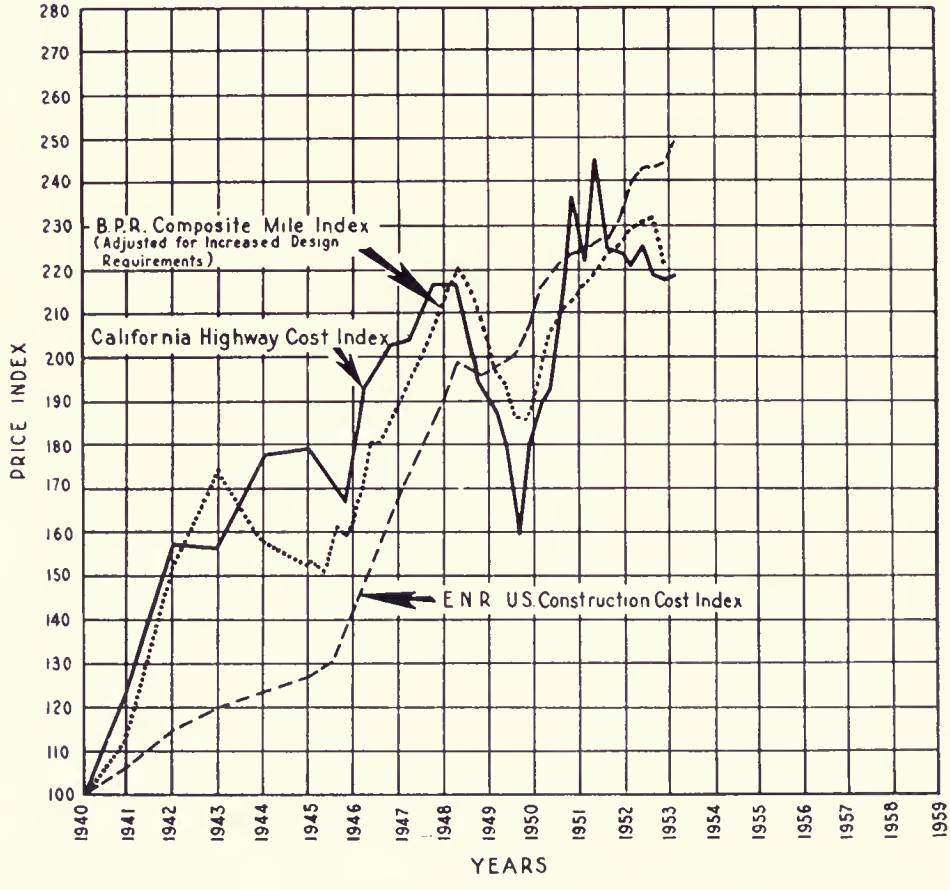
The following is a tabulation of the California Highway Construction Cost Index by years and quarters since 1940:

Yeor	Cost index
1940	100.0
1941	125.0
1942	157.5
1943	156.4
1944	177.8
1945	179.5
1946	179.7
1947	203.3
1948	216.6
1949	190.7
1950 (1st quarter)	160.0
1950 (2d quarter)	180.0
1950 (3d quarter)	189.2
1950 (4th quarter)	194.8
1951 (1st quarter)	215.4
1951 (2d quarter)	238.3
1951 (3d quarter)	221.9
1951 (4th quarter)	245.4
1952 (1st quarter)	224.8
1952 (2d quarter)	224.4
1952 (3d quarter)	221.2
1952 (4th quarter)	226.2
1953 (1st quarter)	218.3

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

PRICE INDEX CONSTRUCTION COSTS

1940 = 100



Year	Cost index
1953 (2d quarter)	217.5
1953 (3d quarter)	218.0

Costs Stationary

The index for the first three quarters of 1953 would indicate that construction costs have been practically stationary during the nine months. In the over-all this is the case, but for the individual construction items there has been some fluctuation, both up and down, as may be noted in the accompanying tabulation of average contract prices.

Roadway excavation which had dropped from 66 cents per cubic yard

. . . Continued on poge 56

CALIFORNIA DIVISION OF HIGHWAYS AVERAGE CONTRACT PRICES

	Roadway excavation, per cu. yd.	Crusher run base, per ton	Plant-mix surfacing, per ton	Asphalt concrete pavement, per ton	PCC pavement, per cu. yd.	PCC structures, per cu. yd.	Bar reinforcing steel, per lb.	Structural steel, per lb.
1940	$0.22	$1.54	$2.19	$2.97	$7.68	$18.33	$0.040	$0.083
1941	0.26	2.31	2.84	3.18	7.54	23.31	0.053	0.107
1942	0.35	2.81	4.02	4.16	9.62	29.48	0.073	0.103
1943	0.42	2.26	3.71	4.76	11.48	31.76	0.059	0.080
1944	0.50	2.45	4.10	4.50	10.46	31.99	0.054	0.132
1945	0.51	2.42	4.20	4.88	10.90	37.20	0.059	0.102
1946	0.41	2.45	4.00	4.68	9.48	37.38	0.060	0.099
1947	0.46	2.42	4.32	5.38	12.38	48.44	0.080	0.138
1948	0.55	2.43	4.30	5.38	13.04	49.86	0.092	0.126
1949	0.49	2.67	4.67	4.64	12.28	48.67	0.096	0.117
1st quarter 1950	0.34	2.22	3.65	3.74	----	40.15	0.077	0.081
2d quarter 1950	0.40	2.13	4.48	3.74	10.86	43.03	0.080	0.105
3d quarter 1950	0.41	2.32	4.25	5.50	10.91	44.34	0.093	0.131
4th quarter 1950	0.42	2.81	4.64	4.61	12.55	43.18	0.098	0.120
1st quarter 1951	0.45	3.07	4.06	5.22	11.71	46.38	0.103	0.206
2d quarter 1951	0.63	3.88	4.56	4.63	12.93	51.50	0.105	0.166
3d quarter 1951	0.56	2.88	4.59	3.90	12.41	46.14	0.107	0.165
4th quarter 1951	0.66	2.91	5.66	4.89	12.71	49.38	0.105	0.169
1st quarter 1952	0.56	3.25	4.88	4.77	14.25	47.46	0.094	0.152
2d quarter 1952	0.53	3.19	5.29	4.13	14.20	49.12	0.091	0.143
3d quarter 1952	0.55	2.61	5.49	4.60	12.80	48.21	0.094	0.132
4th quarter 1952	0.66	2.68	4.97	----	12.53	48.45	0.094	0.128
1st quarter 1953	0.45	2.48*	5.27	4.46	12.47	53.19	0.098	0.150
2d quarter 1953	0.50	2.07	5.38	4.59	13.06	52.68	0.091	0.132
3d quarter 1953	0.54	2.15	5.30	4.82	13.78	49.23	0.092	0.129

* Untreated rock base substituted for crusher run base at this point.

NUMBER AND SIZE OF PROJECTS, TOTAL BID VALUES AND AVERAGE NUMBER OF BIDDERS

(July 1, 1952, to June 30, 1953

Project volume	Up to $50,000	$50,000 to $100,000	$100,000 to $250,000	$250,000 to $500,000	$500,000 to $1,000,000	Over $1,000,000	All projects
Road projects:							
No. of projects	149	42	67	30	14	8	310
Total value (bid items)	$3,266,574	$3,017,829	$10,575,448	$9,953,453	$9,566,240	$11,208,491	$47,588,035
Avg. no. bidders	4.5	5.0	5.9	5.8	8.2	7.4	5.2
Structure projects:							
No. of projects	40	20	10	6	5	3	84
Total value (bid items)	$896,140	$1,443,987	$1,714,427	$2,097,372	$3,233,306	$5,242,057	$14,627,289
Avg. no. bidders	4.8	6.9	9.2	9.0	9.4	9.3	7.2
Combination:							
No. of projects	----	----	----	----	2	8	10
Total value (bid items)	----	----	----	----	$1,917,715	$19,972,108	$21,889,823
Avg. no. bidders	----	----	----	----	3.0	8.0	7.0
Summary:							
No. of projects	189	62	77	36	21	19	404
Total value (bid items)	$4,162,714	$4,461,816	$12,289,875	$12,050,825	$14,717,261	$36,422,656	$84,105,147
Avg. no. bidders	4.7	5.6	6.3	6.8	9.0	7.9	5.7

Total Average Bidders by Months

	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	Year
1952-53	4.3	4.3	5.9	5.1	5.9	4.8	5.5	6.1	7.5	6.4	5.9	6.0	5.7
1951-52	4.3	4.0	4.6	4.4	8.0	7.3	7.6	6.4	6.9	6.0	4.5	4.8	5.3

NUMBER OF BIDDERS PREQUALIFIED TO BID ON STATE HIGHWAY CONSTRUCTION

The following data shows number of contractors qualified to bid state highway projects as of July 1, 1953. Based on their maximum ratings, these 691 contractors are grouped as follows:

10,000,000 and over	— 32
5,000,000 to 10,000,000	— 66
2,500,000 to 5,000,000	—117
1,500,000 to 2,500,000	—184
1,000,000 to 1,500,000	—233
500,000 to 1,000,000	—337
250,000 to 500,000	—481
100,000 to 250,000	—575
50,000 to 100,000	—607
up to 50,000	—691

The combined bidding capacity on June 30, 1953, of these 691 contractors was $1,345,632,100, or in round figures one billion three hundred fifty million dollars.

In arriving at this combined bidding capacity figure all ratings in excess of 20 million dollars are entered at the 20 million dollar figure.

Last year at this time there were 611 prequalified contractors with a combined bidding capacity of $1,-118,337,500, using the twenty million dollar cut-off point.

NEW PASADENA BRIDGE OPENED TO TRAFFIC

By R. C. KENNEDY, Secretary, California Highway Commission

When the Guy F. Atkinson Co., contractors building the new bridge across the Arroyo Seco at Pasadena, decided that construction had progressed to the point where the old bridge had to be closed and the north side of the new bridge opened for traffic the City of Pasadena decided that there should be a celebration.

The matter was taken up with the city council, called the board of directors in Pasadena, and the mayor appointed a committee to handle the details of the dedication ceremonies for the opening of the new bridge. Two members of the board of directors, representatives of the Pasadena Historical Society, Pasadena Pioneer Association, Native Sons, Native Daughters, the Chamber of Commerce and Harrison R. Baker, vice chairman of the California Highway Commission, were appointed by Mayor Winder as a committee.

The celebration started with a luncheon at the Pasadena Elks Club sponsored by the Kiwanis Club. Over 200 people sat down for lunch and to listen to short talks by representatives of the different groups.

After the lunch the entire group repaired to the east end of the bridge. Here a speakers' platform had been erected and the site of the proverbial ribbon cutting was established.

Part of the celebration was a parade of old horse-drawn vehicles and ancient model automobiles.

The highlight of the occasion was the cutting of the ribbon. Helping Harrison Baker was Mrs. Alice Eaton Smith of Berkeley, California. She had come to Pasadena at the invitation of the committee just for this purpose. Her grandfather was the first president of the original "Orange Grove Society" that was made up of members of the "Indiana Colony," who really founded Pasadena on January 27, 1874.

It was in 1911 that the start of the old bridge was made. That year Pasadena voted a bond issue of $100,000 which was matched by the County of Los Angeles. Formal opening of the old bridge took place on December 13, 1913.



At ribbon-cutting ceremony. LEFT TO RIGHT—Guy F. Atkinson, Mrs. Alice Eoton-Smith, Highway Commissioner Horrison R. Boker

It was in May, 1951, that ground breaking ceremonies were held celebrating the start of construction of the new bridge. And it was on October 8, 1953, that part of the new bridge was opened for traffic. Just 40 years between ceremonies of the start and finish of both bridges.

The old bridge has a 28-foot roadway with pedestrian walks.

Joe O. Mattson, New Head Automotive Safety Foundation

Joe O. Mattson of Long Beach, California, has been named president of the Automotive Safety Foundation, it is announced by General Levin H. Campbell, Jr., chairman of the foundation's board of trustees.

Mattson succeeds Pyke Johnson, who has retired as operating head of the organization. General Campbell said that Johnson will continue to serve the foundation in a consulting capacity.

Formerly Director of the Department of Motor Vehicles in California, Mattson was born in Los Angeles, and received his education in the Long Beach public schools and at Oregon State College. He started his career with the motor vehicle department as a driver license examiner in Pasadena in 1934, later working his way to the top of the organization as a civil service employee.

In 1940 Mattson left the department to join the field staff of the Automobile Manufacturers Association. He transferred to the Automotive Safety Foundation early in 1942, and was immediately loaned to the Highway Traffic Advisory Committee to the War Department, working in the West during the war with the 7th, 8th and 9th Service Commands.

Mattson has remained on the Pacific Coast since the war, first in the foundation's Laws Division, and in recent years as assistant to the president whom he now succeeds.

OLD SANTA FE TRAIL

Commerce along the old Santa Fe Trail ran into big business, according to the National Automobile Club. One firm had 3,500 wagons, 4,500 men, 40,000 oxen, and 1,000 mules on the trail over which they hauled 16,000,000 pounds of goods annually in the early 1850's.

District VII Maintenance Employees Picnic



Lunch time at District VII. Third annual Maintenance Department picnic.

By LEO LINDE, Accounting Technician III

Approximately 350 District VII maintenance employees and their families enjoyed a full day of festivities at the Third Annual Maintenance Picnic held in Brookside Park at the Pasadena Rose Bowl on October 17, 1953.

These picnics, under the guidance of W. D. Sedgwick, Assistant District Engineer, have become an exciting affair eagerly looked forward to and attended by the many Maintenance Department families from all corners of the district.

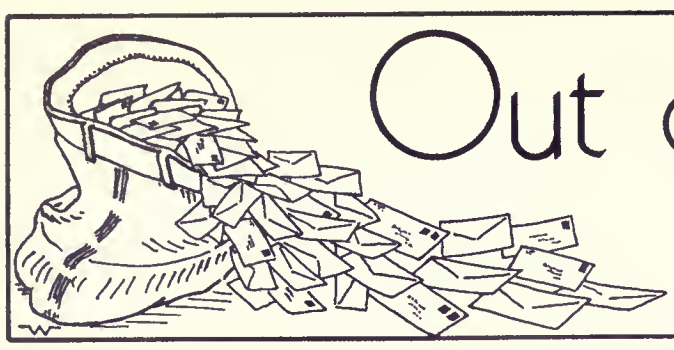
The program opened with several competitive sporting contests, principal among which was the baseball elimination series. The baseball championship was won by Superintendent John O'Malley's select team, which is proudly displaying the trophy award at its San Fernando office.

After a well-planned midday feast everyone gathered at the pavilion to witness a program of excellent entertainment, the awarding of prizes and a community sing. The most noteworthy of the entertainment was a one-act play portraying the adventures of an engineer's humble family, starring W. L. Fahey, District Engineer. A treat for everyone was the astounding feats of magic performed by the near-professional prestidigitator A. S. L. Hewes, Traffic Signal Technician.

The success of the outing is demonstrated by the enthusiastic interest shown in already planning next year's picnic.

SHOWING OFF

The next time you feel the urge to show off when behind the wheel of a car remember that it takes but a split second, just a panic stricken moment of confusion, to switch from spectacular driving to spectacular disaster.



Out of the Mail Bag

FROM NEW YORK

2175 Cedar Avenue
New York 68, New York

California Highways and Public Works
Sacramento, California

GENTLEMEN: I have been reading and enjoying for the past two years your excellent public works magazine entitled "*California Highways and Public Works*." I should like to complement your organization on its content and the manner in which it is written.

As one who is actively engaged in the design and construction of major highways in the East and along the Eastern Seaboard, I am writing to ask if my name could not be added to your mailing list to receive your publication.

Thanking you for your consideration,

Yours very truly,
MILTON SCHWARTZ

ANOTHER USE FOR MAGAZINE

THE PRESBYTERY OF LOS ANGELES
Los Angeles 13, California

November 2, 1953

MR. KENNETH C. ADAMS, *Editor*

DEAR MR. ADAMS: I want to take this means to express my appreciation for the magazine *California Highways and Public Works* which I receive regularly. I have read it most diligently and have found many helpful suggestions in our work in the establishment of new churches in Southern California. It has been extremely helpful also in the development of our inner city ministry in the inner city of Los Angeles, particularly as it relates to your freeway development.

Very sincerely,
JAMES WILLIAM BAIRD
Director of Missions

THANKS FROM RED CROSS

AMERICAN RED CROSS
Oakland Chapter

OAKLAND 7, CALIFORNIA
September 30, 1953

San Francisco-Oakland Bay Bridge
Roadway Service
Toll Plaza, San Francisco

GENTLEMEN: Our motor service fleet cars have driven many, many miles across the Bay Bridge in the last 10 years without mishap of any kind.

Yesterday one of our drivers had a flat tire on the bridge.

Tow Truck No. 1, Driver J. Thornton, was close at hand and changed the wheel on the car without compensation of any kind.

We should like you to know that we are deeply appreciative of the courtesy extended to us both by your organization and by Mr. Thornton personally.

Most sincerely,
MRS. GERTRUDE W. SELOVER
Equipment Officer

WE WILL SEND MORE MAGAZINES

BOARD OF HARBOR COMMISSIONERS
Long Beach 2, California

MR. KENNETH C. ADAMS, *Editor*

DEAR MR. ADAMS: One or two members of this organization have been receiving your publication for several years, and during that time my section has been able to obtain and read it intermittently. I have found many articles not only interesting but containing valuable information in regard to right of way work.

The Harbor Department has grown to such size and is so spread out geographically that it is now next to impossible to see the magazine. I therefore repeat my request of a year ago, that I be placed on your mailing list for your very fine publication.

I shall be happy at a future date to furnish you with extensive information on the development of the Harbor Department's program of bridge and freeway construction which is now in progress over and adjacent to the Los Angeles River. As you may know, our area is at the terminus of the state-constructed Long Beach Freeway which is a branch of the Santa Ana Freeway.

Let me assure you that I shall continue to give your magazine maximum circulation among the members of this organization who are desirous of reading it.

Sincerely,
MAX J. DURHAM
Senior Harbor Engineer
Chief, Right of Way Section

FIRE-FIGHTING AID

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE
Angeles National Forest
LOS ANGELES 12, CALIFORNIA

October 8, 1953

State of California
Division of Highways
Los Angeles, California

GENTLEMEN: May we take this opportunity to express our appreciation to your department for the assistance offered during the recent Fish Fork fire in the Angeles National Forest.

Your assistance in providing road maintenance on the San Gabriel Canyon Road, Highway 39, enabled our men and equipment to perform their job in a more efficient manner.

Again may we say thanks for your generous cooperation.

Very truly yours,
WM. V. MENDENHALL
Forest Supervisor

AN APPRECIATIVE READER

September 3, 1953
Ankara

Mr. Kenneth C. Adams, *Editor*

Dear Mr. Adams: It is indeed very kind of you to send me *California Highways and Public Works* regularly. I take great pleasure reading it and flatter myself that I know many of your friends, though I missed meeting you. It would have been very useful for me while I stayed with the Division of Highways if I had been able to follow up the way you prepare such a wonderful magazine.

The new publications of Division of Highways which I receive through Mr. Maynard Glass, and *California Highways and Public Works* give me further training and make it possible for me to keep up to date with the most advanced methods on highway engineering.

Sincerely yours,

Huseyin H. Conturk
Karayollari
Etut ve Proje Mudurlugu
Diskapi-Ankara
Turkey

MAGAZINE APPRECIATED

DEPARTMENT OF WATER AND POWER
The City of Los Angeles

Kenneth C. Adams, *Editor*

Dear Sir: Enclosed is the annual card mailed to me for checking the current addresses of those lucky enough to receive your splendid publication, *California Highways.*

Really, you haven't any idea how very much I enjoy reading some of the articles and keeping abreast of the times as to our great highway programs, especially so because of being employed in our City of Los Angeles Water and Power Department in the Water System Specification Section, where our particular functions are to prepare purchasing specifications for construction jobs and materials. I always pass these very acceptable issues on to other persons in our department who also are interested.

Thank you so much for them and I shall appreciate receiving them in the year to come.

Very truly yours,

Grace L. Sampson

A SEA CAPTAIN SPEAKS

AMERICAN PRESIDENT LINES
ON BOARD S. S. PRESIDENT PIERCE
Yokohama, Japan
September 12, 1953

Mr. Kenneth C. Adams, *Editor*

Dear Sir: It has been my good fortune in the past to receive your excellent publication. It is one of *the* most interesting and outstanding magazines of its kind.

Aboard this vessel we carry passengers to all parts of the world and they, the passengers, surely enjoy reading and receive much valuable information from your fine magazine about the State of California and its public works.

I want you to know that I greatly appreciate your courtesy in sending me the magazine and that I make very good use of the publication. Please continue to send it as long as you find it possible to do so.

Regarding the article on roadside trash, as a master of a vessel I believe in cleanliness. We do not pollute the world's harbors and there is a very heavy fine and jail sentence for those careless enough to do so. Why not make an official endorsement to enact the same punishment to the garbage pigs of the highways?

Very sincerely yours,

Capt. F. P. Willarts
Master, S. S. President Pierce

FROM AN OLD TIMER

Redwood City

Kenneth C. Adams, *Editor*

Dear Mr. Adams: I wish to say I've enjoyed every copy of your magazine for the past 14 years.

All the features are very interesting and to see the improvement in the methods of construction is to me outstanding. When just a young man of 20, I drove an old dump truck on the highway out of Dixon. We'd back it up to a mixer or on the open road bed—usually the hydraulic lift would break down and then a shovel did the job. Even when it was 100 degrees in the shade.

Yours for continued success with the magazine,

Sincerely,

A. H. Storch

LIKES MAGAZINE

7525 Eighth Avenue
Las Angeles 43, California

To the Editor: I would like to congratulate you and the members of your staff on the wonderful job you have been doing to inform the public of California and other states on the progress and innovations of the Division of Highways with your publication *California Highways and Public Works.* I have utilized your publication on numerous occasions in my engineering classes at the University of Southern California.

The magazine is superbly edited in that it appeals to both the layman and the engineer. The articles are written in such a manner as to present technical information which may be readily understood by the layman and yet is not over simplified. From the standpoint of the engineer, the magazine provides an opportunity to be informed of the various problems which are encountered by our highway engineers and their methods of solution.

I have received your publication for the past two years and would like to continue to receive it.

Thank you,

Joe Vicelja

PRAISE FOR FREEWAYS

State of California
Division of Highways
Los Angeles, California

Dear Sirs: Please consider this as a letter of thanks and appreciation to all the people concerned in the building of the beautiful new freeways in Los Angeles and vicinity. I just can't express the wonderful feeling that overcomes me when I drive on the gorgeous system of highways.

I sincerely wish I could have the opportunity of meeting the engineers and laborers who have developed their skill to the point of achieving this sight.

As I drove on the new link of the Santa Ana Freeway yesterday a feeling of pride swelled in my heart to imagine that only two years ago the road wasn't even scratched through, and it has all brought about a drastic development of Downey. We bought our home just three years ago in

Downey amidst old orange groves and dusty streets, and so you can imagine how much I appreciate all the work and effort put forth by everyone involved in the vastness of the Los Angeles freeways.

Thanking you again, I am one Californian who would never object to the "gas tax" when you can see the money spent for benefit of the taxpayer.

Sincerely,

Gloria Earnshaw
9009 Parrot Avenue,
Downey, California

MR. BOOKER THANKS YOU, TOO

Mr. B. W. Booker
Assistant State Highway Engineer
150 Oak St., San Francisco, Cal.

Dear Sir: The following residents living along the Bear Creek Road wish to express their appreciation for the fine improvement recently completed by your forces on State Highway No. 5 immediately east of the Brown School, and to commend the workmen for their courtesy to the traveling public while performing the work.

	No. People	*No. Cars*
Mickey Miller	2	2
Stanley MacCarty	4	3
Henry B. Thomas	3	2
Earl Glunt	2	2
Don Wentworth	2	2
Don Meagher	4	2
Fred E. Starr	3	2
Earl H. Hoffman	3	2
A. E. Helwig	4	3
George Van Hagel	2	2
Stuart P. Fletcher	2	1
Jack Stewart	2	3
R. L. Richards	2	1
	35	27

As ever,

R. L. (Dick) Richards
Los Gatos

FROM EMPIRE STATE

STATE OF NEW YORK
DEPARTMENT OF CIVIL SERVICE
Municipal Service Division

Kenneth C. Adams, *Editor*

Dear Mr. Adams: Occasionally a copy of *California Highways and Public Works* such as your May-June issue of 1953 is sent to me because this division is interested in learning more of the activities of your particular department.

The article by Earl Sorenson, equipment engineer, entitled "On-Job Training" was of considerable interest to us because of some of our training problems. Our division's engineering examiner found a great deal of use in Rex Fulton's article on basic photogrammetry for highway engineers.

With the excellence of these two articles in mind, I am wondering if there is any possibility of your placing this division on your mailing list to receive regularly copies of your excellent publication.

Cordially yours,

Henry J. McFarland
Director

Amplified Radio Reports on Road Conditions

Up-to-the-minute information on travel conditions along California state highways will be supplied by radio this winter from a fleet of more than 600 maintenance vehicles as they patrol their assigned routes.

The California Division of Highways has prepared to resume its seasonal publication of a daily road report bulletin. Since last winter it has added two-way FM radio equipment to 100 more of its autos and trucks, making possible improved coverage of state-wide road conditions.

Each year, from the time that travel on major routes is affected by the first snows to reopening of these routes in the spring, the division publishes its daily bulletin of last-minute information reported via radio by the maintenance men who patrol every mile of highway.

Last year the first report went out on November 17, 1952. The final report of the season was issued on April 3, 1953. Two years ago, a year of record-breaking snowfall, the reports spanned a period extending from November 19th all the way to May 3d.

Wide Distribution

The bulletin is normally assembled by 10 o'clock in the morning and ready for distribution to newspapers, wire services, radio stations, auto clubs, truckers, oil companies and other interested media and organizations for dissemination to the motoring public.

Although the primary purpose of the division's FM radio setup is the speeding up of maintenance work and keeping the highways open, other maintenance communications, except emergencies, are suspended during the early morning period while information is being collected for the road condition bulletin.

This year the division announced many improvements in the radio coverage of the roads throughout the State, as well as in the format of the road condition bulletin itself.

More Powerful Equipment

In the Northern California coastal and mountain areas more powerful sending equipment has been installed. Relocation of some fixed relay stations to positions more advantageous for sending has made direct contact with headquarters in Sacramento possible.

In the Los Angeles-Bakersfield-San Fernando area an interlocking radio exchange has been set up which will mean faster correlation and receipt of information concerning conditions along the Ridge Route.

The radio setup in the Inyo-Mono-San Bernardino region east of the Sierra Nevada also has been improved to give better coverage of U. S. 395.

Improvements to the published road condition bulletin itself include an index at the bottom of each page listing roads by route number, making it easier to locate a particular highway; and a list of areas other than snow country where traffic may be subject to delays and suggested detours around sections of road temporarily closed.

Use of two-way radio in state highway operations began 15 years ago, but was limited largely to emergency work in snow areas until after World War II.

Portola Overhead

Continued from page 12 . . .

pulling over the crossing at eight miles per hour or less. Vehicular traffic at this crossing is approximately 5,000 per day. The shortest detour involves a 25-mile trip around Blairsden and this during summer and fall months only, as portions of road are closed after the first snowfall.

Recent traffic checks by the Plumas County Road Department indicate that there are approximately 26 switching movements and 19 through trains per day with delays from 30 seconds to 13 minutes.

The new Portola Overhead and Feather River bridge by no means will serve the local people only. The Plumas County Road Department, under the supervision of County Road Commissioner F. L. O'Rourke, has been reconstructing the Portola-McLear Road, County Road 114, a distance of about eight miles, which connects the Quincy-Reno highway (State Sign Route 24) with Quincy-Truckee highway (State Sign Route 89). The grading has been completed and it is anticipated that the surfacing will be finished by August, 1954, when the overpass project will be opened to traffic.*

With the opening of this improved road a considerable increase in traffic from Graeagle, Clio and Mohawk Valley is expected as Portola is the logical shopping center of this area.

The Plumas County Board of Supervisors and the Road Commissioner are very grateful for the co-operation shown by the Division of Highways and the Bureau of Public Roads and to the group assigned to the project by the Walsh Construction Company.

** Inspection of this road project indicates that the county has designed and is constructing to modern standards. This will be an excellent addition to the Plumas County Road System.*

H. B. LaForge
Engineer of Federal Secondary Roads, State Division of Highways

Partially completed railroad overhead and bridge over north fork of Feather River at Portola. This project is being constructed as a cooperative venture of the County of Plumas, the State of California, and the Federal Government.



Expanded Federal Aid for Nation's Major Highways

A 10-YEAR expanded federal-aid program to improve the Nation's major highways is advocated by Gen. Eugene Reybold, executive vice president of the American Road Builders' Association. The General, wartime chief of the U. S. Corps of Engineers, addressed the annual convention at the Homestead of the Carolinas Branch, Associated General Contractors of America, an affiliate of ARBA.

"The ARBA suggests," he said, " that Congress authorize appointment of a joint committee of the Senate and House to conduct a thorough investigation of the entire national network of highways, including the federal-aid system of interstate, primary, secondary, and urban highways, together with a concurrent study of ways and means for financing requirements for the correction of deficiencies. We are firmly convinced that a bold, realistic 10-year program providing for a stipulated annual expenditure for new highway construction is the goal to be sought."

General Reybold reviewed the status of the Nation's roads in relation to the mounting traffic volume. "The mounting pressure of motor vehicle demands is the challenge that highway planners, designers, and builders must meet," he stated. "We now face an exasperating traffic congestion that is a direct economic drain. As a Nation, we are remiss in not tackling road construction on a really effective scale."

Traffic Count

Freight Vehicles Increasing at Faster Rate Than Passenger Cars

THE ANNUAL state-wide traffic count taken on Sunday and Monday, July 12th, and 13th, 1953, shows an increase of 4.15 percent over the previous annual count of July, 1952, according to State Highway Engineer George T. McCoy. Although this gain is substantially less than has prevailed over the last several years, it is probably too early to predict a leveling off in California's postwar traffic boom.

Monthly traffic counts show that freight vehicles are increasing at a faster rate than passenger vehicles. Also, for the second straight year, Sunday traffic increases are markedly less than those for weekday traffic. These factors point to a lessening of pleasure travel as a factor in the reduced rate of growth.

Count Procedure

No change was made from the regular procedure of previous years in the manner of taking the count. Actual recording covers the 16-hour period from 6 a.m. to 10 p.m. for both Sunday and Monday, totals being shown for each hour. At selected representative stations, counts are also continued for the entire 24-hour period and are extended to record each of the seven days of the week. Traffic is segregated into the following vehicle classifications: California passenger cars, out-of-state passenger cars, busses, pickups, two-axle commercial units, three-axle units, four-axle units, five-axle units, and six-or-more-axle units.

Each year some minor changes in the census becomes necessary, such as the relocation, addition, or discontinuance of individual stations, but in every instance these are excluded in determining comparison with the previous year, only those stations that were identical during both years being taken into consideration.

Various Route Groups

These comparisons for the various route groups are as follows:

PERCENT GAIN OR LOSS FOR 1953 COUNT AS COMPARED WITH 1952

	Sunday	Monday
All routes	+3.47	+4.26
Main north and south routes	+3.69	+4.76
Interstate connections	+3.93	+5.30
Laterals between inland and coast	+2.51	+3.26
Recreational routes	+6.04	+4.22

The gain or loss of traffic volume for State Highway Routes 1 to 80, inclusive, which constitute the basis for the foregoing summary, is shown in the following tabulation:

Route	Termini	1953 Percent gain or loss Sunday Gain	Sunday Loss	Monday Gain	Monday Loss
1.	Sausalito-Oregon Line	9.40		2.71	
2.	Mexico Line-San Francisco	4.44		5.69	
3.	Sacramento-Oregon Line		1.12	3.50	
4.	Los Angeles-Sacramento		3.56		0.46
5.	Santa Cruz-Junction Route 65 near Mokelumne Hill	5.40		5.38	
6.	Napa-Sacramento via Winters	10.16		9.83	
7.	Crockett-Red Bluff	2.45		7.85	
8.	Ignacio-Cordelia via Napa	12.65		0.52	
9.	Route 2 near Montalvo-San Bernardino		0.86	4.02	
10.	Route 2 at San Lucas-Sequoia National Park		3.91		8.20
11.	Route 75 near Antioch-Nevada Line via Placerville	5.15		7.39	
12.	San Diego-El Centro		3.97	3.71	
13.	Route 4 at Salida-Route 23 at Sonora Junction	7.41			0.60
14.	Albany-Martinez		1.03		0.46
15.	Route 1 near Calpella-Route 37 near Cisco	6.52		8.79	
16.	Hopland-Lakeport	5.58		3.69	
17.	Route 3 at Roseville-Route 15, Nevada City	4.01		5.01	
18.	Route 4 at Merced-Yosemite National Park		11.00		6.08
19.	Route 2 at Fullerton-Route 26 at Beaumont		0.40	5.77	
20.	Route 1 near Arcata-Route 83 at Park Boundary	1.60			1.53
21.	Route 3 near Richvale-Route 29 near Chilcoot via Quincy		0.62		0.79
22.	Route 56, Castroville-Route 32 via Hollister	6.36		4.62	
23.	Route 4 at Tunnel Station-Route 11, Alpine Junction	3.30		3.37	
24.	Route 4 near Lodi-Nevada State Line	4.67		2.80	
25.	Route 37 at Colfax-Route 83 near Sattley	16.13		9.88	
26.	Los Angeles-Mexico via San Bernardino		0.79	3.49	
27.	El Centro-Yuma	6.29		2.27	
28.	Redding-Nevada Line via Alturas	9.75		4.11	
29.	Peanut-Nevada Line near Purdy's	16.18		7.70	
30.	Colton-Nevada State Line	3.05		3.50	
31.	Route 56, Watsonville-Route 4 near Califa	5.94		3.16	
32.	Route 56 near Cambria-Route 4 near Famoso	2.38			1.48
33.	Route 4 at Galt-Route 23 at Pickett's Junction	4.22			6.82
34.	Route 1 at Alton-Route 20 at Douglas City	11.66		10.32	
35.	Auburn-Truckee	23.22		9.21	
36.	Route 11 at Mays-Nevada Line via Truckee River	8.46			3.87
37.	Route 38 at Tahoe City-Nevada State Line	4.16		6.17	
38.	Route 13 near Montezuma-Route 76 at Benton	21.75		20.24	
39.	Route 5 near Tracy-Kings River Canyon via Fresno		4.18		8.06
40.	Redwood Park-Los Gatos	13.71			0.74
41.	Route 60 at Newport Beach-Route 31 near Victorville	11.71		10.23	
42.	Boulder Creek-Redwood Park	17.04		1.73	
43.	Route 7, Willows-Route 3 near Biggs		7.81	0.83	
44.	Route 1 near Klamath-Route 3 near Cray		25.66		10.55
45.	Route 7, Orland-Route 29 near Morgan	0.28			1.28
46.	Route 1 north of Cloverdale-Route 56 near Albion	5.05			6.27
47.	Napa-Route 15 near Sweet Hollow Summit	8.15		9.20	

D. E. Watkins Retires as CSAA Manager; E. S. Moore Is Successor

RETIREMENT of D. E. Watkins as secretary and general manager of the California State Automobile Association and appointment of Edwin S. Moore as his successor was announced by Harold J. McCurry, CSAA president.

The fortieth anniversary of Watkins' appointment to the position on October 13, 1913, was marked by a special meeting of the CSAA Board of Directors in San Francisco Tuesday evening, October 13th, honoring his four decades in the service of California motorists.

Moore, who has been Watkins' assistant since last January, is widely known as head of the CSAA's public safety, legislative and highway development activities. He was manager of the association's Public Relations Department for 11 years and assistant manager of the department nine years. An attorney, he started with the association in 1927 on the Law Department staff.



Edwin S. Moore, newly elected secretary and general manager of the California State Automobile Association

During the 40 years of Watkins' administration, the motorists' organization has grown from a membership of about 500 with a one-room office in San Francisco's Monadnock Building to a membership exceeding 280,000 with its own building at Van Ness Avenue and Hayes Street and district offices in 46 cities of northern and central California and Nevada. It is now one of the largest of the 276 motor clubs affiliated with the American Automobile Association. Watkins retires with the distinction of the longest term of service of any AAA club executive. He organized and managed AAA clubs in Nebraska, his native state, and in Kansas for three years before coming to California in 1913.

Route Termini	1953 Percent gain or loss Sunday Gain	Sunday Loss	Monday Gain	Monday Loss
48. Sacramento-Route 15 near Wilbur Springs	7.06		4.56	
49. Route 8 at Shellville-Sebastopol	5.88		6.68	
50. Alto-Tiburon	12.42		20.17	
51. Route 7 at Fairfield-Route 4 near Lodi via Rio Vista		1.58	1.58	
52. Route 11 at Perkins-Route 65 at Central House		9.49		21.59
53. Route 5 near Glenwood-San Francisco	11.14		15.05	
54. Route 2 at Las Cruces-Route 1 near Fernbridge	7.04		3.74	
55. Route 2 near Santa Maria-Route 23 near Freeman via Bakersfield		1.99		0.69
56. Route 2 near Santa Margarita-Arizona Line near Topock via Mojave and Barstow		0.04	9.72	
57. Route 4 at Gorman-Route 43 at Lake Arrowhead	7.59		15.56	
58. Route 2 at Serra-Route 2 at El Rio	8.85		12.64	
59. Route 4 south of Glendale-Route 59 near Phelan		13.09	7.05	
60. Route 171 near Buena Park-Route 61 near Crystal Lake	13.97		28.10	
61. Big Pine-Nevada State Line		23.55		37.18
62. Route 2 at San Juan Capistrano-Blythe		10.25		1.40
63. Route 18 near Mariposa-Auburn	5.26		5.27	
64. Route 5 near Mossdale-Route 13 near Oakdale	0.90			1.74
65. Pajaro River-Route 2 near San Benito River Bridge	8.02		5.43	
66. San Jose-San Francisco	7.29		3.03	
67. Route 5 at Warm Springs-Route 1, San Rafael	6.44		3.23	
68. Uklah-Talmage	6.10			12.41
69. Crescent City-Oregon Line		10.30	10.38	
70. Weed-Oregon Line	14.49		10.55	
71. Route 29 near Johnstonville-Oregon Line	1.72		6.51	
72. Napa Wye-Cordelia via Vallejo and Benicia		8.84		13.05
73. Oakland-Junction Route 65 at Altaville	5.49		4.77	
74. Route 125 at Shaw Ave.-Nevada State Line near Benton	1.09		5.98	
75. San Diego-Los Angeles via Pomona	0.18		6.91	
76. Route 12 near Descanso-Route 19 near March Field	10.60		17.69	
77. Route 2, Ventura-Route 4 at Castaic	2.69		7.83	
78. Route 51, Rincon Creek-Route 2 near Zaca		16.36		9.66

URBAN PROBLEMS STRESSED

Urban transportation is the subject of one large section in the *Proceedings* of the 1953 California Street and Highway Conference. The *Proceedings* have just been published by the Institute of Transportation and Traffic Engineering, University of California. They are for sale by the University Press, Berkeley 4, California.

Specialists from different parts of the Country contributed papers to the California conference, and participated in a panel discussion. Both the papers and panel discussion are included in the *Proceedings*. Among the contributors: Richard Graves, executive director, League of California Cities; Charles E. DeLeuw, engineer, Chicago; and Edward G. Wetzel, highway planning engineer, the New York Port Authority.

AIR CLEANER

The air cleaner on your car should be serviced regularly to insure efficient engine operation, reminds the California State Automobile Association. Under normal operation this should be done every 1,000 miles.

HIGHWAY BIDS AND AWARDS

October, 1953

ALAMEDA COUNTY—At the intersection of San Pablo Avenue with Washington Avenue (West) in the City of Albany, a traffic signal system to be furnished and installed. District IV, Route 14. Hall-Sloat Electric Co., Inc., Oakland, $7,111; L. H. Leonardi Electric Construction Co., San Rafael, $7,136; Abbett Electric Corp., San Francisco, $7,489; R. Goold & Son, Stockton, $7,542; R. Flatland, San Francisco, $7,700; Jones Electric Co., Inc., Hayward, $7,984; Manning & Whitaker, Inc., San Francisco, $9,294. Contract awarded to Scott-Buttner Electric Co., Inc., Oakland, $6,910.

CONTRA COSTA COUNTY—Across the track of the Atchison, Topeka & Santa Fe Railway Co. at 47th Street in Richmond and at San Pablo Creek at the north city limit of San Pablo, respectively, a reinforced concrete railroad overhead and a reinforced concrete arch culvert to be constructed. District IV, Routes 14, 69. Stolte, Inc., & Cantor & Coull, Oakland, $298,546; O. C. Jones & Sons, Berkeley, $305,044; Tumblin Co., Bakersfield, $308,248; Peter Kiewit Sons' Co., San Francisco, $322,755; Granite Construction Co., Watsonville, $328,806; Walsh Construction Co., San Francisco, $330,624; Gordon H. Ball and San Ramon Valley Land Co., Berkeley, $339,592; Dan Caputo, San Jose, $344,598; Fredrickson & Watson Construction Co., M & K Corp., Oakland, $347,639; C. K. Moseman, Redwood City, 362,365; Victor Weidmer, Penryn, $366,100; G. M. Carr Co. and Bati Rocca, Santa Rosa, $366,304; George Pollock Co., Sacramento, $367,235; Erickson, Phillips & Weisberg, Concord, $367,268; Lew Jones Construction Co., San Jose, $372,031; Stanley H. Koller Construction, Crockett, $378,006; Charles MacClosky Co., San Francisco, $461,944. Contract awarded to MacDonald, Young & Nelson, Inc., San Francisco, $294,738.50.

CONTRA COSTA COUNTY—Between 1.5 and 0.9 mile north of Glen Fraser, about 0.6 mile, riprap and concrete embankment and channel protection to be constructed. District IV, Route 106, Section A. Robert R. Murdoch, Oakland, $14,940; Charles S. Moore, San Jose, $15,290; Eugene G. Alves, Pittsburg, $15,383; Bos Construction Co., Berkeley, $15,607; James W. Hill, Walnut Creek, $16,276; R. G. Clifford and C. O. Bodenhamer, Berkeley, $16,932; Morison Construction Co., Nevada City, $17,021; Al Erickson & Co., Napa, $17,369; Gallagher & Burk, Inc., Oakland, $17,977; J. Henry Harris, Berkeley, $18,013. Contract awarded to O. C. Jones & Sons, Berkeley, $14,522.

LOS ANGELES COUNTY—On the Santa Ana Freeway in the City of Los Angeles, between Ramona Freeway and Seventh Street, additional ramps to be graded and paved with asphalt concrete on Portland cement concrete base. District VII, Route 2. George W. Peterson and Jack W. Baker, Los Angeles, $229,332; R. R. Hensler, Sun Valley, $243,394; Norman I. Fadel, North Hollywood, $260,321; Contract awarded to Webb & White, Los Angeles, $223,286.60.

LOS ANGELES COUNTY—In the City of Los Angeles adjacent to State Route 2 on Hewitt Street, between Commercial Street and Ducommon Street, freeway connection to be constructed. District VII, Route 2. T. E. Sherlock, El Monte, $10,208; Jesse S. Smith, Glendale, $10,374; George W. Peterson and Jack W. Baker, Los Angeles, $12,010; Griffith Company, Los Angeles, $13,066. Contract awarded to C. O. Sparks, Inc., and Mundo Engineering Company, Los Angeles, $9,602.50.

LOS ANGELES COUNTY—City of Los Angeles on Harbor Freeway between Flower Street and Olympic Boulevard, highway lighting and illuminated sign system to be furnished and installed. District VII, Route 165. Electric & Machinery Service, Inc., South Gate, $81,678; Ets-Hokin & Galvan, Wilmington, $82,469; C. D. Draucker, Inc., Los Angeles, $84,455; Fischbach and Moore, Inc., Los Angeles, $85,353; A. S. Schulman Electric Company, Los Angeles, $85,626; Newbery Electric Corp., Los Angeles, $86,213; Ed Seymour, Long Beach, $86,848. Contract awarded to Westates Electrical Construction Co., Los Angeles, $80,542.

LOS ANGELES COUNTY—In the City of Los Angeles on Manchester Boulevard between Lincoln Boulevard and near Osage Avenue, about 1.3 miles in net length, roadway intersections to be channelized, reinforced with untreated rock base, and surfaced with plant-mixed surfacing. District VII, Routes 174, 60, 158. Schroeder & Company, Sun Valley, $72,919; George Savala Paving Co., Inc., Hawthorne, $74,458; C. O. Sparks, Inc., and Mundo Engineering Co., Los Angeles, $74,671; Warren Southwest, Inc., Torrance, $75,519. Contract awarded to Jesse S. Smith, Glendale, $62,092.50.

Cost Index

Continued from page 46 . . .

to 45 cents during the first quarter of 1953 climbed back to 50 cents in the second quarter and to 54 cents in the third quarter. Similarly Portland cement concrete pavement which dropped slightly during the first quarter rose during the second and third quarter to reach a price of $13.78 per cubic yard, the highest in over a year. Structure concrete continued to drop as it has during the entire year, the $49.23 price per cubic yard being $3.45 less than in the second quarter and $3.96 less than in the first quarter of 1953. There wasn't a great deal of change in steel prices, bars were up one-tenth of a cent while structural steel continued to decline, being down four-tenths of a cent.

In the face of increasing wages in both the construction industry and manufacturing, there are several factors which apparently are of sufficient influence to offset the inflationary tendencies of rising wages. Competition in bidding continues to increase. In the last quarter it has been an unusual project which attracted less than six or seven bidders and on many the number of bidders has been from 12 to 15 or 16.

The governmental freeze on the anticipated extensive defense construction programs continues, leaving some California contractors who thought they had firm contracts for such work holding empty sacks while the programs are reviewed.

Another factor which undoubtedly has had considerable effect in lowering bid prices is the stabilization of materials availability. Over an extended period contractors in preparing bids have been faced with uncertainty resulting from short supply in various lines of materials. Steel, in its various forms of bars, shapes, and plates, was not available; forgings were difficult to secure; cement, plywood and other materials have from time to time been in very short supply. In some cases, resort to the "gray market" appeared to be the only solution and bidders added a percentage, possibly as high as 10 percent, to allow for added costs of securing materials to complete their contracts in the specified time. The muddied waters of materials availability have cleared and the sand in the bottom of the pool may be seen. It may be that elimination of a bid factor to care for the uncertainties in delivery of materials is sufficient to offset in some degree the effects of past and current wage increases in both the construction industry and manufacturing.

Comparison of the California Highway Construction Cost Index with the Bureau of Public Roads Composite Mile Index and the Engineering News-Record Construction Cost Index shows the latter continuing its slow but steady rise and the B. P. R. composite mile index more or less following the pattern of the California index.

It is the belief of this department that while many inflationary tendencies are becoming stabilized, the demands for increased wages will continue, with the result that highway construction costs will tend to rise to some degree.

Accompanying tabulations show: (1) the average unit price by years and quarters for the eight basic highway construction items on which the California index is based (2) the average number of bidders on various sized contracts for the fiscal year from July 1, 1952, to June 30, 1953; and (3) the number of bidders prequalified to bid on state highway construction on June 30, 1953, grouped to the several brackets of bidding capacity.

LOS ANGELES AND VENTURA COUNTIES—At the intersections of Ventura Boulevard with Lewis Road and in the City of Oxnard, Oxnard Boulevard with First Street, Colonia Road, Deodar Avenue and Palm Drive, traffic signal and highway lighting systems to be furnished and installed and channelization to be constructed. District VII, Routes 2, 60. C. D. Draucker, Inc., Los Angeles, $17,438; Westates Electrical Construction Co., Los Angeles, $17,563; Drury Electric Co., San Bernardino, $17,704; Fischbach and Moore, Inc., Los Angeles, $17,918. Contract awarded to Electric and Machinery Service, Inc., South Gate, $16,905.50.

MADERA COUNTY—Between 2.6 miles north of Fresno county line and Califa, about 11 miles in net length, roadside areas to be prepared and planted. District VI, Route 4, Sections A,B,C. Diablo View Gardens, Antioch, $15,080; Huettig, Schromm & Bennett, Inc., Palo Alto, $22,026; Watkins & Sibbald, San Anselmo, $24,247; Justice-Dunn Co., Oakland, $26,431. Contract awarded to Oliver's Nursery, Fresno, $13,230.10.

MENDOCINO COUNTY—At Big Gulch, about 13 miles south of Point Arena, about 1.1 miles to be graded and surfaced with road-mixed surfacing on cement treated base and an arch culvert to be constructed. District I, Route 56, Section A. Arthur B. Siri, Inc., Santa Rosa, $151,300; Transocean Engineering Corp., Hayward, $179,270; Huntington Bros., Napa, $180,959; Eaton and Smith, San Francisco, $218,414; Nomellini Construction Co., Stockton, $230,958. Contract awarded to Claude C. Wood Co., Lodi, $139,964.30.

MERCED COUNTY—Portions between 10 miles west of Merced and Merced, about 3.9 miles to be widened and resurfaced with plant-mixed surfacing and untreated rock base, two reinforced concrete bridges to be widened and one reinforced concrete bridge to be constructed. District X, Route 122, Section B. Granite Construction Co., Watsonville, $329,469; Volpa Brothers, Fresno, $344,707; Norman I. Fadel, North Hollywood, $402,270. Contract awarded to M. J. Ruddy & Son, Modesto, $300,754.

MONTEREY COUNTY—Between 2 miles north of Gonzales and Chualar, about 3.8 miles to be graded and paved with Portland cement concrete on cement treated subgrade. District V, Route 2, Sections C,B. Clyde W. Wood & Sons, Inc., North Hollywood, $525,561; Gordon H. Ball and San Ramon Valley Land Co., Berkeley, $528,597; Ukropina, Polich, Kral and John R. Ukropina, San Gabriel, $556,389; Fredrickson & Watson Construction Co., Oakland, $581,029. Contract awarded to Granite Construction Co., Watsonville, $499,353.50.

RIVERSIDE COUNTY—In the City of Beaumont, at the intersections of Sixth Street with California Avenue-Grace Avenue and with Beaumont Avenue, traffic signal systems and highway lighting to be installed. District VIII, Route 26. Drury Electric Co., San Bernardino, $25,387; Electric and Machinery Service, Inc., South Gate, $27,514. Contract awarded to Fischbach and Moore, Inc., Los Angeles, $24,385.

RIVERSIDE COUNTY—In the City of Perris on D Street between Fourth Street and 0.2 mile north of San Jacinto Avenue, about 0.5 mile to be resurfaced with plant-mixed surfacing. District VIII, Route 78. E. L. Yeager Co., Riverside, $8,790; R. A. Erwin, Colton, $9,240. Contract awarded to Geo. Herz & Co., San Bernardino, $8,235.

SAN BERNARDINO COUNTY—In and adjacent to the Cities of Upland and Ontario, between Central Avenue and Archibald Avenue, highway lighting and illuminated sign systems to be furnished and installed. District VIII, Route 26. Drury Electric Co., San Bernardino, $68,208; C. D. Draucker, Inc., Los Angeles, $69,465; Ets Hokin & Galvan, Wilmington, $69,900; Fischbach and Moore, Inc., Los Angeles, $71,653; Westates Electrical Construction Co., Los Angeles, $72,026. Contract awarded to Paul R. Gardner, Ontario, $67,876.

SAN DIEGO COUNTY—Between the international border and 0.3 mile south of Nestor, about 3.9 miles to be graded and surfaced with plant-mixed surfacing on cement treated base and two reinforced concrete bridges to be constructed, to provide a four-lane divided freeway. District XI, Route 2, Section G. Griffith Company, Los Angeles, $1,110,216; R. R. Hensler, Sun Valley, $1,110,912; M. H. Golden Construction Co., San Diego, $1,146,489; Cox Bros. Construction Co., Stanton, $1,172,018; Webb & White, Los Angeles, $1,211,355; J. A. Thompson & Son, Inglewood, $1,235,404; Winston Bros. Company, Monrovia, $1,240,329; Peter Kiewit Sons' Co., Arcadia, $1,273,297; E. T. Haas Co., Belmont, $1,281,333; Fredericksen & Kasler, Sacramento, $1,346,635; Daley Corp., San Diego, $1,450,007. Contract awarded to J. A. Payton, Riverside, $1,094,357.

SAN DIEGO COUNTY—Between 0.3 mile west of Palomar Mountain Road and northeast boundary of Rancho Cuca, about 1.9 miles in length to be graded and bituminous surface treatment applied thereto. District XI, Route 195, Section D. E. L. Yeager Co., Riverside, $197,800; L. C. Anderson Co. and E. Paul Ford Co., San Diego, $199,557; Einer Bros., Inc., Escondido, $208,885; Clyde W. Wood & Sons, Inc., North Hollywood, $218,338; Chas. J. Rounds Co., Los Angeles, $237,089; Ralph B. Slaughter, Julian, $250,626; Cox Bros. Construction Co., Stanton, $255,298; Matich Bros., Colton, $280,265; Ralph A. Bell, San Marino, $280,762; Webb & White, Los Angeles, $293,721; Norman I. Fadel, North Hollywood, $333,814. Contract awarded to Arthur B. Johnson, Laguna Beach, $179,263.

SAN DIEGO COUNTY—Between Barrett Junction and 1.9 miles east, about 1.9 miles to be graded and bituminous surface treatment applied, and a reinforced concrete bridge to be constructed. District XI, Route 200, Section C. Ball and Simpson, Berkeley, $433,732; Clyde W. Wood & Sons, Inc., North Hollywood, $441,902; Hess Construction Co., Inc., Long Beach, $476,124; W. F. Maxwell and C. G. Willis & Sons, Inc., Los Angeles, $480,727; E. C. Young & Service Construction Co. of Southern California, Sun Valley, $491,598; James E. Roberts, San Bernardino, $517,169; Walter H. Barber, La Mesa, $527,853; Cox Bros. Construction Co., Stanton, $537,030; Ralph A. Bell, San Marino, $555,384; Webb & White, Los Angeles, $561,106; Contract awarded to L. C. Anderson Co. and E. Paul Ford Co., San Diego, $386,499.40.

SAN FRANCISCO COUNTY—Between Eighth Street and Fourth Street, a portion of a bridge and miscellaneous road work to be constructed. District IV, Route 68. Rothschild, Raffin & Weirick & Pacific Bridge Co., San Francisco, $3,708,891; Guy F. Atkinson Co., South San Francisco, $3,768,893; Peter Kiewit Sons' Co., San Francisco, $3,781,337; Fredrickson & Watson Construction Co., M & K Corp., Oakland, $3,810,547; A. Teichert & Son, Inc., Sacramento, $3,914,099; Ukropina, Polich, Kral and John R. Ukropina, San Gabriel, $3,918,187; Winston Bros. Co., Monrovia, $3,919,455; Stolte, Inc. and The Duncanson-Harrelson Co., Oakland, $3,978,104; Granite Construction Co., Watsonville, $3,981,690; Contract awarded to Chas. L. Harney, Inc., San Francisco, $3,680,237.

SAN JOAQUIN COUNTY—About 0.1 mile southerly of intersection of Bird and Linne Roads, at Siphon Curve, about 0.5 mile to be graded and surfaced with plant-mixed surfacing on untreated rock base. District X, Route 41, Section A. M. J. Ruddy & Son, Modesto, $85,631; Browne & Krull, Hayward, $88,151; O. C. Jones & Sons, Berkeley, $88,478; A. Teichert & Son, Inc., Sacramento, $88,518; Stanfield & Moody, Tracy, $90,247; Claude C. Wood Co., Lodi, $91,095; Friant Construction Co., Fresno, $92,521; S. M. McGaw Co., Inc., Stockton, $94,844; Nomellini Construction Co., Stockton, $106,444; Ace Excavators, Oakland, $136,095. Contract awarded to Stephens Trucking Co., French Camp, $84,106.25.

SAN LUIS OBISPO COUNTY—Between Huer Huero Creek and one mile west of Estrella River about 3 miles east of Paso Robles, about 7.3 miles to be graded and paved with plant-mixed surfacing on imported base material and cement treated base and two reinforced concrete bridges to be constructed. District V, Route 33, Section A. Fredericksen & Kasler, Sacramento, $771,796; Stolte, Inc., and Stephens Trucking Co., Oakland, $804,475; Granite Construction Co., Watsonville, $808,428; Fredrickson & Watson Construction Co., Oakland, $817,038; Griffith Co., Los Angeles, $839,742; L. C. Smith Co., San Mateo, $841,855; J. A. Thompson & Son, Inglewood, $855,126; Clyde W. Wood & Sons, Inc., North Hollywood, $877,419; A. Teichert & Son, Inc., Sacramento, $892,774; R. R. Hensler, Sun Valley, $899,679; John Delphia, Patterson, $907,093; Gordon H. Ball and San Ramon Valley Land Co., Berkeley, $910,561; Guy F. Atkinson Co., South San Francisco, $911,691; McCammon-Wunderlich Co., Palo Alto, $914,535; G. W. Ellis Construction Co. and L. A. & R. S. Crow, North Hollywood, $925,478; Eaton & Smith, San Francisco, $954,550; J. E. Haddock, Ltd., Pasadena, $969,160; M. J. B. Construction Co. and M. J. Ruddy & Son, Stockton, $990,591; D & H Construction Co. and M. H. Hasler Construction Co., Sacramento, $1,197,730. Contract awarded to Madonna Construction Co., San Luis Obispo, $695,878.40.

SANTA BARBARA COUNTY—In the City of Santa Barbara, between Park Place and Rancheria Street, about 2.2 miles of roadside areas to be prepared and planted, sprinkler system to be modified and areas to be surfaced with plant-mixed surfacing and Portland cement concrete. District V, Route 2. Stephen L. Vistica, San Mateo, $61,517; Henry C. Soto Corp., Los Angeles, $66,400; Justice-Dunn Co., Oakland, $70,056; James E. Bonthe, Compton, $73,647; Huettig, Schromm & Bennett, Inc., Palo Alto, $73,965; Jannoch Nurseries, Altadena, $81,335. Contract awarded to Watkin & Sibbald, San Anselmo, $60,726.94.

SANTA CLARA COUNTY—City of Santa Clara, at the intersection of El Camino Real with Gould Street-Scott Lane, traffic signal system and highway lighting to be furnished and installed and intersection improvement to be constructed. District IV, Route 2. O. C. Jones & Sons, Berkeley, $20,554; A. J. Raisch Paving Co., San Jose, $21,360; J. Henry Harris, Berkeley, $21,400; J. C. Bateman, Inc., San Jose, $25,887. Contract awarded to Howard Electric Co., Gilroy, $19,223.50.

SANTA CLARA COUNTY—1.2 miles westerly of Saratoga, existing concrete structures to be removed and metal bin-type retaining wall and roadway shoulder to be constructed. District IV, Route 42, Section A. Granite Construction Co., Watsonville, $17,478; Lew Jones Construction Co., San Jose, $19,336; J. Henry Harris, Berkeley, $20,455; Flora Crane Service, San Francisco, $23,691. Contract awarded to O. C. Jones & Sons, Berkeley, $15,919.75.

SOLANO COUNTY—Between 0.7 mile and 0.9 mile east of Ulatis Creek near Vacaville, frontage road to be graded and paved with plant-mixed surfacing. District X, Route 7, Section D. A. Teichert & Son, Inc., Sacramento, $18,732; Harms Bros., Sacramento, $19,412; O. C. Jones & Sons, Berkeley, $20,087; J. Henry Harris, Berkeley, $22,790. Contract awarded to Fredrickson Bros., Emeryville, $17,788.

SOLANO COUNTY—At two locations about 3 miles west of Cordelia Underpass and about 2.4 miles west of Cordelia Underpass, about 3,065 lineal feet of metal plate guard railing to be constructed in the median strip. District X, Route 7, Section H. Al Erickson & Co., Napa, $11,187; Geo. Pollock Co., Sacramento, $11,861; Charles S. Moore, San Jose, $12,106; Bos Construction Co., Berkeley, $12,934. Contract awarded to Wulfert Co., San Leandro, $9,149.

SOLANO COUNTY—Between Vallejo and Benicia (portions), about 0.5 mile of highway shoulders to be reconstructed. District X, Route 74, Section B, Ben. J. Henry Harris, Berkeley, $12,423; Contract awarded to O. C. Jones & Sons, Berkeley, $9,438.50.

STANISLAUS COUNTY—At Modesto Irrigation District Main Canal Bridge, about 0.8 mile north of junction with State Route 109, existing bridge to be replaced with reinforced concrete pipe and roadbed resurfaced with plant-mixed surfacing on untreated rock base. District X, Route 13, Section A. M. J. Ruddy & Son, Modesto, $22,046; H. H. Anderson, Hayward, $22,222; Standard Materials, Inc., Modesto, $22,701; M. W. McLam, Merced, $26,427; Alpine Construction Co., Inc., Oakland, $28,251. Contract awarded to Friant Construction Co., Fresno, $21,604.

TEHAMA COUNTY—Across various streams between Corning and the south county boundary, nine existing reinforced concrete bridges to be widened. District II, Route 7. R. G. Clifford and C. O. Bodenhamer, Berkeley, $154,548; A. A. Edmondson, Butte City, $159,680; James H. McFarland, San Francisco, $165,771; Bishop, Younger, Bradley Co., San Francisco, $170,006; O'Connor Bros., Red Bluff, $171,565; Nomellini Construction Co., Stockton, $173,278; Bos Construction Co., Berkeley, $178,231; Tumblin Co., Bakersfield, $180,661; Norman I. Fadel, North Hollywood, $230,125; Underground

Construction Co., Oakland, $236,181; Charles MacClosky Co., San Francisco, $264,818. Contract awarded to Ruby Construction Co., Inc., and H. W. Ruby, Sacramento, $139,963.50.

TULARE COUNTY—Between Ash Avenue near Tulare and Route 132, about one mile to be graded and surfaced with plant-mixed surfacing on cement treated base. District VI, Route 134, Section B. Baun Construction Co., Fresno, $191,012; Guy F. Atkinson Co., South San Francisco, $199,848; Gordon H. Ball and San Ramon Valley Land Co., Berkeley, $208,112; Stephens Trucking Co., French Camp, $213,904; Rice Bros., Inc., Marysville, $214,524. Contract awarded to Thomas Construction Co., Fresno, $183,465.50.

F. A. S. County Routes

FRESNO AND KINGS COUNTIES—Across Kings River, Clark's Fork of Kings River, and Kings River Overflow, near Hanford, three reinforced concrete bridges to be constructed. District VI, Routes 820, 940, 568. C. K. Moseman, Redwood City, $127,397; Gene Richards, Inc., Fresno, $127,543; Thomas Construction Co., Fresno, $129,921; C. B. Tuttle, Long Beach, $129,973; Norman I. Fadel, North Hollywood, $133,955; Bishop Younger Bradley Co., San Francisco, $134,005; S & Q Construction Co. and Rayor Construction Co., South San Francisco, $134,819; G. M. Carr Co. and Bati Rocca, Santa Rosa, $135,498; O. B. Pierson, Bellflower, $139,331; Sooy & Jackson & Marks Bros. Construction Co., Redlands, $142,114; Trewhitt-Shields & Fisher, Fresno, $143,715; Bos Construction Co., Berkeley, $166,470; Sharp & Fellows Contracting Co., Los Angeles, $166,959. Contract awarded to Gordon H. Ball and San Ramon Valley Land Co., Berkeley, $124,350.

KERN COUNTY—On Stockdale Road, between Oak Street and Allen Road, about 6.1 miles, to be graded and surfaced with plant-mixed surfacing on cement treated base. District VI, Route 575. Dicco, Inc., Bakersfield, $126,129; Stephens Trucking Co., French Camp, $144,211. Contract awarded to Griffith Company, Los Angeles, $112,405.15.

MODOC COUNTY—Across five canals near Stronghold, five concrete slab bridges to be constructed. District II, Route 1192. James B. Allen, San Carlos, $63,279; James H. McFarland, San Francisco, $65,338; Al Erickson & Co., Napa, $67,073. Contract awarded to A. A. Edmondson, Butte City, $50,968.20.

TULARE COUNTY—At various locations between about 3.4 miles north and 0.7 mile west of Farmersville, three reinforced concrete bridges and one reinforced concrete culvert to be constructed. District VI, Routes 1136 and 1143. W. M. Lyles Co., Avenal, $80,794; Thomas Construction Co., Fresno, $82,973; C. B. Tuttle, Long Beach, $88,434; Monterey Construction Co., El Monte, $88,818; Tumblin Company, Bakersfield, $88,895; Alpine Construction Co., Inc., Oakland, $102,846. Contract awarded to Rice Brothers, Inc., Marysville, $77,893.40.

November, 1953

ALAMEDA COUNTY—Between Ashby Avenue and El Cerrito Overhead, about 3 miles to be graded and paved with portland cement concrete on cement-treated subgrade and separation structures to be constructed. District IV, Routes 69, 206. Frederickson & Watson Construction Co. M & K Corp., Oakland, $4,640,170; A. Teichert & Son, Inc., Sacramento, $4,679,778; Chas. L. Harney, Inc., San Francisco, (a) $4,781,887; (b) $5,220,607; Ukropina, Polich, Kral & John R. Ukropina, San Gabriel, $4,836,134; Guy F. Atkinson Co., South San Francisco, $4,870,218; MacDonald, Young, & Nelson, Inc. and Morrison, Knudsen Co., Inc., San Francisco, $5,172,609; Construction Aggregates Corp., San Francisco, $5,466,479. Contract awarded to Peter Kiewit Sons Co., San Francisco, $4,387,474.50.

ALAMEDA COUNTY—On Mattox Road between East 14th Street and 300 feet east of Oak Street, about 0.4 mile to be widened and resurfaced with plant-mixed surfacing. District IV, Route 228, Section A. Independent Construction Co., Oakland, $20,996; O. C. Jones & Sons, Berkeley, $21,023; J. Henry Harris, Berkeley, $25,092; Clements Construction Co., Hayward, $25,189; McGuire & Hester, Oakland, $28,397; John A. Carstensen, Castro Valley, $29,645; Silva Bros., Hayward, $30,195. Contract awarded to Lee J. Immel, San Pablo, $19,912.50.

HUMBOLDT COUNTY — At intersection of Routes 1 and 56 at Fernbridge, about 0.3 mile to be widened and resurfaced. District I, Route 1, Section G. Fredrickson Bros., Emeryville, $19,935. Contract awarded to Mercer, Fraser Co. & Mercer, Fraser Gas Co., Inc., Eureka, $19,200.

HUMBOLDT COUNTY—In Whittemore Grove State Park, between South Fork Eel River Bridge and west park boundary, about 0.7 mile to be graded and surfaced. District I. John Burman & Sons, Eureka, $44,750; Humboldt Constructors, Inc., Eureka, $50,528; J. Henry Harris, Berkeley, $67,896. Contract awarded to Paul E. Woof, Fresno, $35,928.

IMPERIAL COUNTY—Between east city limits of El Centro and 0.3 mile east of State Route 201, about 2.4 miles, roadbed to be graded and surfaced with plant-mixed surfacing on cement treated base. District XI, Route 27, Section C. Peter Kiewit Sons Co., Arcadia, $329,706; R. R. Hensler, Snn Valley, $356,671; James E. Roberts, San Bernardino, $358,263; Ralph B. Slaughter, Julian, $364,431; G. W. Ellis Construction Co., North Hollywood, $367,601; Clyde W. Wood & Sons, Inc., North Hollywood, $367,953; Cox Bros. Construction Co., Stanton, $389,845. Contract awarded to Basich Bros. Construction Co., R. L. and N. L. Basich, South San Gabriel, $324,485.75.

LASSEN COUNTY—Between Secret Valley and 4.7 miles north, about 4.7 miles to be graded and surfaced with road-mixed surfacing on untreated rock base. District II, Route 73, Section D. Eaton & Smith, San Francisco, $514,379; T. E. Connolly, Inc., San Francisco, $533,090; A. Teichert & Son, Inc., Sacramento, $587,761; H. Earl Parker, Inc., Marysville, $591,495; M. Malfitano & Son, Inc., Pittsburg, $611,519; Fredrickson & Watson Construction Co., Oakland, $624,453. Contract awarded to Harms Bros., Sacramento, $491,161.50.

MONTEREY COUNTY—About 0.2 mile west of Bradley, existing reinforced concrete bridge to be widened and about 0.6 mile of approaches to be graded and surfaced with plant-mixed surfacing on cement-treated base. District V, Route 2, Section I. Thomas Construction Co., Fresno, $104,401; Norman I. Fadel, North Hollywood, $113,965; Granite Construction Co., Watsonville, $130,051. Contract awarded to Bos Construction Co., Berkeley, $87,769.

MONTEREY COUNTY—Between 0.1 mile north of Seaside Junction and Prattco Siding, south bound roadway of four-lane highway to be graded and surfaced. District V, Route 56, Section I. J. Henry Harris, Berkeley, $39,246. Contract awarded to Granite Construction Co., Watsonville, $29,817.20.

MARIN AND SONOMA COUNTIES—Between Ignacio and 1.5 miles south of Petaluma, chain link fences and concrete curbs to be constructed. District IV, Route 1, Sections A,C. Baldwin Contracting Co., Inc., San Rafael, $8,175; Bos Construction Co., Berkeley, $8,281; Charles S. Moore, San Jose, $8,670; Wulfert Co., San Leandro, $9,476; Watkins & Sibbald, San Anselmo, $9,533; Underground Construction Co., Oakland, $9,960; Crocco & Hanson, Vallejo, $12,299. Contract awarded to J. Henry Harris, $7,617.65.

MARIPOSA COUNTY—Between 0.2 mile south of King Solomon Mine and Briceburg, about 2.5 miles to be graded and surfaced with plant-mixed surfacing on untreated rock base. District X, Route 18, Section E. Ball & Simpson, Berkeley, $575,683; Eaton & Smith, San Francisco, $611,607; H. Earl Parker, Inc., Marysville, $644,762; Piombo Construction Co., San Francisco, $691,956. Contract awarded to Harms Bros., Sacramento, $570,614.

SAN BERNARDINO COUNTY—Across Blossom Ditch, about 13 miles east of Barstow, a reinforced concrete bridge to be constructed. District VIII, Route 58, Section F. C. B. Tuttle, Long Beach, $8,812; Tumblin Co., Bakersfield, $9,430; Norman I. Fadel, North Hollywood, $9,571; Monterey Construction Co., El Monte, $10,113; E. F. Grandy, Laguna Beach, $10,140; Albert S. Pratt, Jr., Pasadena, $11,428; Fred D. Kyle, Pasadena, $11,504; Lloyd R. Johnson, Rialto, $11,648; Trott & Kingaard, Inc., Solano Beach, $11,982; Hubbs Equipment Co., Colton, $12,572; Gerstenberger and Pierson, Los Angeles, $12,755; Kast Construction Co., Inc., Manhattan Beach, $13,357; Ruane Corp., San Gabriel, $13,500; Owl Truck & Construction Co., Compton, $15,516; E. L. Yeager Co., Riverside, $15,526; Ragenovich Construction Co., Los Angeles, $18,031. Contract awarded to Louis J. Strona, Pomona, $8,809.89.

SAN DIEGO COUNTY—Construction of drainage facilities between Laurel Street and San Diego River channel at Lakeside. District XI, Route 198, Section B. Sim J. Harris Co., San Diego, $3,348. Contract awarded to R. E. Hazard Contracting Company, San Diego, $3,870.85.

SAN DIEGO COUNTY—Between 5.6 miles and 3.6 miles west of Ramona, at east limits of Ramona and at Sutherland Dam Road, a net length of 1.7 miles to be graded and bituminous surface treatment to be applied and cut slopes to be excavated at Sutherland Dam Road. District XI, Route 198, Sections H & D. Robert E. L. Parker Company, Claremont, $113,488; Norman I. Fadel, North Hollywood, $116,930; James E. Roberts, San Bernardino, $126,553; Ralph B. Slaughter, Julian, $130,962. Contract awarded to Einer Bros., Inc., Escondido, $102,752.55.

SAN LUIS OBISPO COUNTY—In the City of San Luis Obispo at the intersection of Santa Rosa Street with Foothill Boulevard, traffic signal system and highway lighting to be furnished and installed. District V, Route 56. Electric & Machinery Service, Inc., South Gate, $14,385; Collins Electrical Co., Inc., Stockton, $14,470; A. R. Ochs, San Luis Obispo, $14,950; L. H. Leonardi Electric Construction Co., San Rafael, $16,754. Contract awarded to Ed. H. Anderson, Santa Maria, $12,181.

SAN LUIS OBISPO COUNTY—Between Route 56 near Morro Bay and 2.6 miles east, about 2.6 miles to be graded, imported subbase and base material to be placed and bituminous surface treatment to be applied. District V, Route 125, Section A. Madonna Construction Co., San Luis Obispo, $132,160; Paul E. Woof, Fresno, $135,055; Clyde W. Wood and Sons, Inc., North Hollywood, $135,537; Granite Construction Co., Watsonville, $139,923; Brown & Krull, Hayward, $142,410; A. G. Raisch Co., San Rafael, $159,613. Contract awarded to Valley Paving Company, Pismo Beach, $113,274.

STANISLAUS COUNTY—Between Empire and Waterford, about 7.6 miles to be widened and resurfaced with plant-mixed surfacing. District X, Route 110, Section C. Ralph B. Slaughter, Julian, $103,610; Ukropina, Polich, Kral and John R. Ukropina, San Gabriel, $108,940. Contract awarded to M. J. Ruddy & Son, Modesto, $91,551.

TULARE COUNTY — Across Kaweah River, about 4.6 miles east of Woodlake, about 0.4 mile in length, new bridge to be constructed and approaches to be graded and surfaced with plant-mixed surfacing on untreated rock base. District VI, Route 131, Section C. O. B. Pierson, Bellflower, $153,766; Norman I. Fadel, North Hollywood, $167,592; Thomas Construction Co., Fresno, $167,761; C. B. Tuttle, Long Beach, $170,253; Gordon H. Ball and San Ramon Valley Land Co., Berkeley, $176,209; Sharp & Fellows Contracting Co., Los Angeles, $181,006; Trewhitt-Shields & Fisher, Fresno, $185,289; Charles MacClosky Co., San Francisco, $214.331; Sooy & Jackson & Marks Bros. Construction Co., Redlands, $4,700,463,463 [amount OK]. Contract awarded to W. F. Maxwell, Los Angeles, $142,521.

VENTURA COUNTY—Between Station 312 and Station 340, near Moorpark, four corrugated metal pipe culverts to be furnished and installed. District VII, Route 155, Section B. Union Construction Co., Inc., Ventura, $2,967; D. E. Higday, Temple City, $3,582; Jesse S. Smith, Glendale, $4,273; N. M. Saliba Company, Los Angeles, $5,226. Contract awarded to Daniel W. Thaxton, Oxnard, $2,815.

F. A. S. County Routes

CONTRA COSTA COUNTY—Alhambra Avenue Extension and Pleasant Hill Road, between State Route 106 and 2.6 miles south, about 2.6 miles to

be graded and surfaced with plant-mixed surfacing on crusher run base. District IV, Route 796. Fredrickson & Watson Construction Co., M & K Corp., Oakland, $329,080; Stephens Trucking Co., French Camp, $332,406; Gallagher & Burk, Inc., Oakland, $333,971; McGuire & Hester, Oakland, $343,978; Fredrickson Bros., Emeryville, $345,607; J. R. Armstrong, El Cerrito, $347,451; O. C. Jones & Son, Berkeley, $347,726; Gordon H. Ball & San Ramon Valley Land Co., Berkeley, $349,573; Lee J. Immel, San Pablo, $361,399; Vega Engineering and Grading Co., Berkeley, $372,033. Contract awarded to Eugene C. Alves Construction Co., Inc., Pittsburg, $308,357.50.

FRESNO COUNTY—On Clovis Avenue between State Route 4 and Columbia Avenue, about 5.3 miles to be graded and surfaced with plant-mixed surfacing on cement-treated base. District VI, Route 814. Stewart & Nuss, Fresno, $195,493; Gene Richards, Inc., Fresno, $199,487; Volpa Bros., Fresno, $208,176; Baun Construction Co., Fresno, $217,834; Clements Construction Co., Hayward, $221,582; G. W. Ellis Construction Co., North Hollywood, $227,288; M. J. Ruddy & Son, Modesto, $231,653; Harms Bros., Sacramento, $245,469; Gordon H. Ball & San Ramon Valley Land Co., Berkeley, $267,735; A. G. Raisch Co., San Rafael, $270,124. Contract awarded to Rice Brothers, Inc., Marysville, $195,104.64.

HUMBOLDT COUNTY—Across Martin's Slough, about four miles south of Eureka, a reinforced concrete bridge to be widened. District I, Route 970. Contract awarded to James H. McFarland, San Francisco, $19,412.

LOS ANGELES COUNTY—On Slauson Avenue between Telegraph Road and Rosemead Boulevard, about 1.1 miles to be graded and paved with asphalt concrete on untreated rock surfacing and base and a reinforced concrete bridge to be constructed. District VII, Route 844. J. A. Thompson & Son, Inglewood, $481,107; Ukropina, Polich & Kral, and John R. Ukropina, San Gabriel, $483,106; W. F. Maxwell, Los Angeles, $502,123; Tom E. Norcross, Rex W. Murphy & Boddum Construction, Long Beach, $512,410; O. B. Pierson, Bellflower, $513,135; Griffith Company, Los Angeles, $516,144; Byerts & Sons, and Geo. K. Thatcher, Los Angeles, $531,690; Norman I. Fadel, North Hollywood, $535,687; George W. Peterson and Jack W. Baker, Los Angeles, $538,440; A. Teichert & Son, Inc., Baldwin Park, $542,493; Charles MacCloskey Company, San Francisco, $544,352; J. E. Haddock, Ltd., Pasadena, $544,407; John Strona, Pomona, $548,265; Guy F. Atkinson Company, Long Beach, $582,341; Dragline Rentals Co., Long Beach, $583,417. Contract awarded to Webb & White, Los Angeles, $478,074.04.

MADERA COUNTY—Across Ash Slough, about 3 miles west of Chowchilla, a reinforced concrete slab bridge to be constructed. District VI, Route 1197. Charles S. Moore, San Jose, $53,428; Friant Construction Co., Fresno, $53,720; Gene Richards, Inc., Fresno, $53,949; Monterey Construction Co., El Monte, $54,248; James H. McFarland, San Francisco, $54,678; C. B. Tuttle, Long Beach, $54,962; Lew Jones Construction Co., San Jose, $55,650; W. F. Maxwell, Los Angeles, $56,910; Norman I. Fadel, North Hollywood, $57,430; Al Erickson & Co., Napa, $62,380; Nomellini Construction Co., Stockton, $64,560; Trewhitt-Shields & Fisher, Fresno, $65,257. Contract awarded to G. M. Carr Co. & Bati Rocca, Santa Rosa, $52,875.

SAN DIEGO COUNTY—On Mission Gorge Road, between Powers Street and Twain Avenue, and between north end of Mission Gorge and Woodside Avenue in Fanito Rancho, about 1.3 miles in length to be graded and surfaced with plant-mixed surfacing on imported base material. District XI, Route 731. Sim J. Harris Company, San Diego, $145,547; Einer Brothers, Inc., Escondido, $149,042; Daley Corp., San Diego, $152,352; R. E. Hazard Contracting Co., San Diego, $161,879. Contract awarded to V. R. Dennis Construction Co., San Diego, $133,884.60.

SHASTA COUNTY—Between 0.2 mile south of Palo Cedro and Bella Vista about 5.9 miles to be graded and surfaced with plant-mixed surfacing on imported base material. District II, Route 1073. Harms Bros., Sacramento, $290,693; Close Building Supply Inc., Hayward, $322,922; A. Teichert & Son, Inc., Sacramento, $323,570; Transocean Engineering Corp., Hayward, $325,609; Ransome Co., Emeryville, $333,149. Contract awarded to Fredrickson & Watson Construction Co., Oakland, $276,428.11.

VENTURA COUNTY—On Hueneme Road, between State Route 60, about 5 miles east of Port Hueneme and Wood Road, a distance of about 0.8 mile to be surfaced with plant-mixed surfacing on untreated rock base and imported borrow. District VII, Route 867. Dimmitt & Taylor, Monrovia, $37,678; Griffith Company, Los Angeles, $40,081; Union Construction Co. of Calif., Inc., Ventura, $42,470. Contract awarded to Baker and Pollock, Ventura, $34,730.

VENTURA COUNTY—On Santa Clara Avenue, between Central Avenue and State Highway Route 9, a length of about 1.5 miles to be graded and surfaced with plant-mixed surfacing on untreated rock base. District VII, Route 871. Griffith Company, Los Angeles, $76,002; Robert E. L. Parker Company, Claremont, $80,141; Union Construction Co. of Calif., Inc., Ventura, $87,271; Dimmitt & Taylor, Monrovia, $88,663. Contract awarded to Baker and Pollock, Ventura, $67,680.50.

Tunnel Illumination

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additional rows of fluorescent fixtures extending from the entering portal to a point approximately 150 feet within the tunnel.

Daytime Lighting

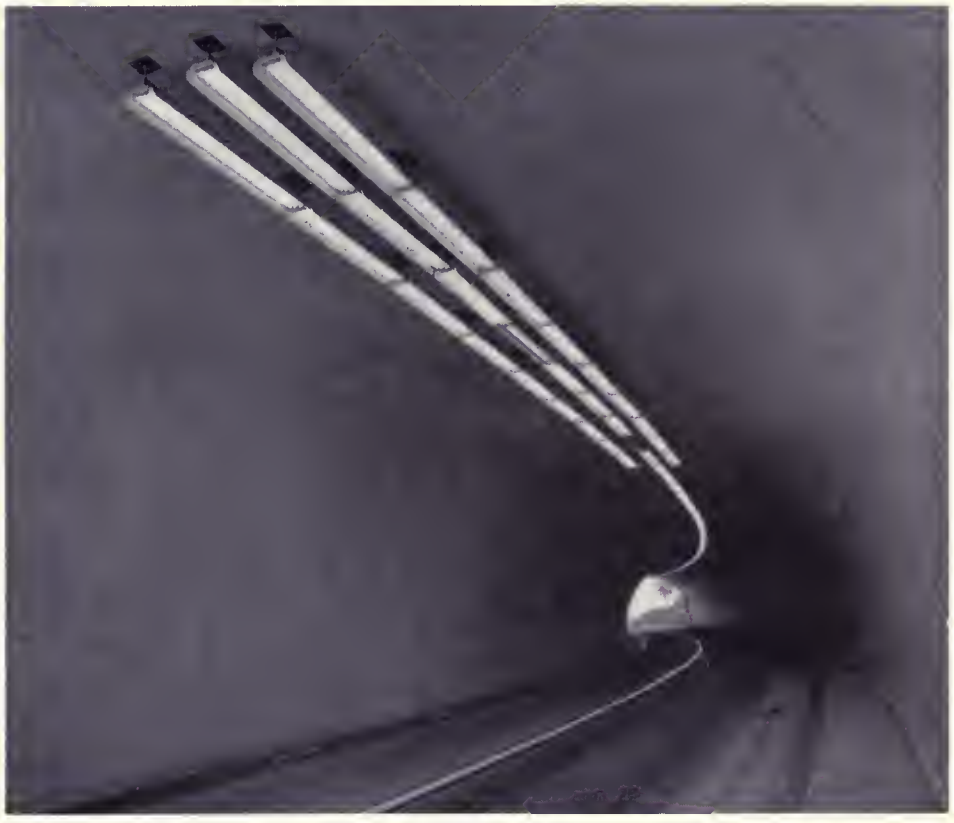
Since the Gaviota Gorge Tunnel is used by northbound traffic only, it was necessary to provide daytime entrance lighting inside the south portal only.

Figure 1 is a curve showing the values of illumination within the tunnel both with natural daylight only and daylight plus electrical illumination.

At night, a photoelectric control switches off all lamps except one in every third fixture so as to provide a reduction in illumination to a level appropriate for night driving.

Initially, the average illumination at the center of the tunnel was approximately 20 footcandles during the day and 3 footcandles at night. After the tunnel has been in use several months these values will be reduced somewhat by accumulated residue from exhaust gases on the tunnel walls.

Looking north inside Gaviota Gorge tunnel



Retirements *from* Service

Milo E. Eidson

On October 3, 1953, Milo E. Eidson retired from the Division of Highways after completing more than 25 years of service, most of which was spent in District VII as a surveyor and engineer. He entered state service on August 2, 1928.

Milo was born on December 28, 1890, in Berthoud, Colorado. His early years were spent on his father's ranch. He was educated in the Colorado public schools and in later years he increased his engineering knowledge by studying night school and correspondence courses.

From 1912 to 1914 he worked as an engineer for the Greeley-Poudre Irrigation District in Greeley, Colorado. In 1915 he spent a short time as an engineer for the Engineers Construction Corporation, also in Greeley. He moved to Denver where he worked for the Denver Tramway Company

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Banquet for Honored Guests

John B. Davidson, Highway Superintendent, and Milo E. Eidson, Junior Civil Engineer, were honored by fellow employees, associates, and friends attending a banquet at Knotts Berry Farm, October 23d. A group of 175 attended the gay retirement party which was spiced with a liberal amount of good-natured ribbing.

District VII and the Santa Ana territory in particular lost two of its most valuable employees. This was evidenced by tributes paid each of them in a talk by Assistant District Engineer W. D. Sedgwick.

The program for the evening was presided over by W. L. Fahey, District Engineer, as master of ceremonies. He kept the dinner guests amused and the honored guests squirming with his witticisms and good-natured razzing. He called upon Paul O. Harding, Assistant State

. . . Continued on page 62

John B. Davidson

After having completed more than 33 years of service with the Division of Highways, John B. Davidson, Superintendent in Santa Ana, retired on November 1, 1953. John was one of the early employees in District II, and also worked for considerable periods in District VII and VIII.

He was born on June 1, 1889, in Goulburn, New South Wales, Australia. His early education was obtained in private schools in Goulburn. He came to this Country with his parents in 1907, and attended Heald's Engineering College in San Francisco for two years. In later years he added to his education by attending various evening schools.

John was first employed by the Division of Highways as a rodman in District II March 20, 1913. In June, 1913, he was promoted to draftsman

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LEFT—Paul O. Harding, Assistant State Highway Engineer, right, presents Milo E. Eidson with a 25-year service pin. RIGHT—John B. Davidson receives retirement scroll from District Engineer W. L. Fahey.



MILO E. EIDSON

Continued from page 60 . . .

from 1915 to 1917. In 1918 he was employed as assistant hydrographer by the State of Colorado. He returned to the Engineers Construction Corporation in Greeley in 1919, as a field engineer in charge of construction, where he remained until 1926 when this corporation was dissolved. He was employed as assistant engineer for the Iowa State Highway Department in 1926, where he remained for approximately one year. In 1927 he moved to Redlands, California, where he worked for the Mountain Water Company, in connection with irrigation pipeline maintenance and repairs.

In 1928 he entered the employ of the State Division of Highways as a rodman on a survey party in District VII. In 1929 he was promoted to instrumentman, and from then until 1936 he worked on various survey parties and construction projects as instrumentman, assistant resident engineer, and chief of party.

When District XI was formed in 1933, he was working in San Diego County and remained with District XI until June, 1934, when he transferred back to District VII.

In 1936 he was promoted to junior highway engineer and worked in the Location Department as an instrument man and chief of party until 1938. He was assigned to the Maintenance Department, with headquarters in Santa Ana, in March, 1938, where he remained as engineering assistant and assistant superintendent until his retirement.

He is highly respected by both his supervisors and fellow employees for his thorough knowledge of the work and his efficiency in getting jobs done. While Milo is a very quiet and retiring person, he is noted for his cheerfulness, sense of humor, and even temper. He will be greatly missed by his friends and associates in Orange County, as well as by the entire District VII staff. However, he will be available to his friends, as he plans to spend considerable time in his woodworking shop and in working around his home.

Clarence F. Woodin

A testimonial dinner for Clarence F. Woodin, Assistant Maintenance Engineer of the Division of Highways who retired after 37 years of state service, was held in Sacramento with about 150 friends and colleagues present on November 2d.



CLARENCE F. WOODIN

Although he served in many different capacities in his early career with the Division of Highways, Woodin has specialized in the highway maintenance field since 1931, working out of headquarters office in Sacramento. Since then he has traveled some 40,000 miles a year, coordinating the work of various district maintenance forces all over California.

Born in Alameda, Woodin received his bachelor of science degree in civil engineering at the University of California in 1914. He promptly joined the staff of the Highway Commission as a draftsman in the district office at Willits, later becoming chief draftsman at the Dunsmuir office.

He left state employ for two years beginning in 1925, engaging in school

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JOHN B. DAVIDSON

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and spent a large portion of his time working on U. S. 99 from Dunsmuir to the Oregon border. In January, 1918, he took military leave of absence and spent approximately a year and a half in the U. S. Corps of Engineers with the A. E. F. in France during World War I. He returned to State employment in August, 1919, as a draftsman in District II where he remained until May, 1923. In May of 1923 he resigned to enter private practice as a civil engineer in Los Angeles. He remained in private practice until November, 1930, at which time he rejoined the State Division of Highways as a maintenance foreman in District VIII. In November, 1932, he was promoted to maintenance superintendent, which position he held in District VIII until May, 1941.

In July, 1939, John took leave of absence to go on a big game hunting expedition in Africa; however, the outbreak of World War II caught him in Paris, and he was unable to continue with his expedition. He returned to work in District VIII in November, 1939. In 1941 he transferred to District VII as the maintenance superintendent in charge of Orange County, with headquarters in Santa Ana. He has remained in this location until his retirement.

His former plans for a big game hunting expedition have not been forgotten and now, in retirement, John plans to spend approximately one year in New Zealand and Australia, under the auspices of the Los Angeles Museum of Natural History, completing its ornithological collection from these two countries. He then plans to spend a year or more on a big game hunting trip through Belgian Congo, Uganda, India, and the Netherlands Indies.

He will be greatly missed by his fellow employees and many friends while he is away, but they are all looking forward to his return so they can view his moving pictures and listen to the stories of his travels.

F. C. Macaulay

On October 31st, Fremont C. (Mac) Macaulay culminated 40 years of continuous State service with the Division of Highways when he retired. For the past 29 years Macaulay has been Highway Maintenance Superintendent in the Redding area for the Division of Highways.



F. C. MACAULAY

Macaulay began his career with the State on November 17, 1913, as a teamster and stake puncher on the first highway location survey between Yreka and the Oregon boundary. The chief of party was the late Spencer W. Lowden and the survey was directed by District Engineer T. A. Bedford and his assistant R. S. Stalnaker. He graduated to chainman in a few months and helped survey several original highway locations in District II. When construction work started in 1914 he was assigned as an engineering aid to this work. Much of the highway construction in early years was performed by State forces under day labor and Mac's duties gradually shifted to that of highway foreman. Among the many construction projects to which he was assigned was the major construction in the Sacramento River Canyon between Pollock and La Moine.

In 1921 he was assigned as Construction Superintendent and subsequently supervised construction of many miles of road in Lassen and Shasta Counties. Included in the project was the construction of the highway over Hatchet Mountain between Montgomery Creek and Burney.

A change of policy in 1924 resulted in the discontinuance of most day labor projects and Mac was assigned to his present position of Maintenance Superintendent of the area between Cottonwood and Pollock and Redding to Adin. Although his territory has changed due to the advent of new roads into the system it has always included the section over Hatchet Mountain that he constructed in 1922, and this section will probably always be considered as "Mac's road."

Macaulay was born at Oro Fino in Siskiyou County on October 11, 1883. This old gold mining town situated in Scott Valley is now a ghost town. His early childhood was spent in this area and at the age of 16 he moved to Walker on the Klamath River. Prior to his employment with the State he engaged in gold mining and farming along the Klamath River from Happy Camp to Hombrook.

Many friends and coworkers attended a dinner and party at the Redding Golf and Country Club on the evening of November 10th in honor of his retirement.

CLARENCE F. WOODIN

Continued from page 61 . . .

construction as a contractor, then rejoined the Division of Highways, serving as resident engineer for District III, Sacramento, until December, 1930. Since then he has been an assistant maintenance engineer.

He has served on nation-wide committees in the highway engineering field for the Highway Research Board of the National Academy of Sciences, and for the American Association of State Highway Officials.

Mr. and Mrs. Woodin and their son, James, live at 611 Garden Street, North Sacramento. Two daughters, Mrs. Barbara J. Corning and Mrs. Virginia L. Massey, live in Stockton and in Bellingham, Wash., respectively.

Master of ceremonies at the testimonial dinner was R. M. Gillis, Deputy State Highway Engineer.

Banquet

Continued from page 60 . . .

Highway Engineer, who responded with a very interesting talk about both honored guests, livened by a clever story aimed at John. Mr. Harding presented Milo with a 25-year service pin and a certificate of service, since just prior to retiring, Milo had completed 25 years.

Milo and John each received a beautifully drawn scroll suitably framed, one side of which expresses the high esteem in which the recipient is held by his fellow employees, the other side bears their signatures.

Continuing the gay atmosphere of the occasion, the present for each man was camouflaged and tagged with humorous appurtenances. John Davidson's wrapped present appeared at first to be a gun, then a telescope, but finally turned out to be a pair of binoculars. Milo Eidson's present was too large to wrap but was liberally tagged with accident reports, sick leave requests, blood stains, and suggestions how to avoid further difficulties with it. After all the attachments were removed, it was revealed to be a table power saw. The two guests of honor then responded with heartfelt speeches of thanks and appreciation.

Bill Axtman, District Maintenance Engineer, Administration, was the official photographer of the occasion and took some excellent photographs of the highlights of the evening. Two sets of these photographs were later bound in photograph albums and each man was presented with a bound set.

EDITOR MAY WRITES

OREGON STATE MOTOR ASSOCIATION

Portland 5, Oregon
November 13, 1953

Kenneth C. Adams, *Editor*

Dear Mr. Adams: The September-October issue of *California Highways and Public Works* has just come across my desk and I just want to take a moment to tell you that it is a splendid and informative issue. Your photographs as well as the articles are quite remarkable and of interest to the layman as well as to the technical road builder.

The issue is going into our files for reference after we have digested what we need to know for the moment.

With good wishes.

Yours sincerely,

Oregon State Motor Association
Walter W. R. May, *Editor*
The Oregon Motorist

N. J. Morrisey Is Named Member of Governor's Cabinet

GOVERNOR KNIGHT'S new State Director of Professional and Vocational Standards, N. J. (Nick) Morrisey of Sacramento, on October 29th was administered his oath of office by Secretary of State Frank M. Jordan. Morrisey succeeds James A. Arnerich, resigned. The salary for the position is $12,000 a year.

Morrisey, 47, has been State Registrar of Contractors since 1950. He has been an employee of the Contractors' State License Board since 1932 when he joined the staff as an investigator. He became deputy registrar in San Francisco in 1939 and was transferred to Sacramento as assistant registrar in 1947.

Knight said that through his long experience he has become an expert in the administration of licensing and regulatory laws. As director of the department of professional and vocational standards, he will supervise 30 state boards and commissions.

Morrisey is a native of San Francisco and attended the University of San Francisco. He resides with his wife and two children at 2749 Eleventh Avenue. He is a member of the Elks, the Knights of Columbus and the Sierra Club.



Secretary of State Frank M. Jordan, left, administers oath of office to N. J. Morrisey

Mineral Show

Continued from page 43 . . .

California Highway Testing Laboratory, and J. B. Nichols, an amateur collector, had such fine collections of rocks that others became interested.

Early records bring back the names of D. Wickham, Clyde Gates and George G. Pomeroy. Among past presidents are: W. R. Lovering of the Division of Highways, J. H. Moon, State Printing Department; O. T. Illerich, Division of Architecture; and Paul Downard of the Department of Institutions. The society president for 1953 is George F. Winslow, associate highway engineer. Honorary membership has been bestowed upon Allan Nicol and J. H. Moon in appreciation of their untiring efforts on behalf of the society.

The Sacramento Mineral Society is composed of people (often referred to as "rockhounds") who enjoy collecting rocks; minerals, and gems; cutting, shaping and polishing those materials to enhance their natural beauty and who have grouped together to give and receive further knowledge of mineralogy, gem cutting, and geology.

The society has grown steadily until now the membership in Sacramento is over 125, many of whom are state employees. There are similar societies scattered throughout the United States, with more than 80 such clubs in California alone.

In the early days of the society, minerals were plentiful and travel over the highways was relatively short. Now that local material has been acquired by most collectors, greater distances to new fields are necessary. Better and extended highways have increased the range of collecting possibilities. Field trips are a fundamental part of every gem or mineral society, and the fine highways over which we travel going to and from the more rugged rock-hunting areas are appreciated by all rockhounds.



Construction at Jack Tone Road overcrossing. Detour at left. New freeway at extreme left.

Ripon-Manteca Job

Continued from page 26 . . .

county road overcrossing will be surfaced with plant-mix over untreated rock base. The new northbound lanes will be of Portland cement concrete construction over cement-treated subgrade. Paving on the project will begin sometime next spring and it is anticipated that the contract will be completed next fall.

This highway lies in the heart of the San Joaquin Valley agricultural region and is a portion of principal inland route US 99 between the Los Angeles, Sacramento, and San Francisco Bay areas. The present average daily traffic is about 12,000 vehicles of which a large percentage is commercial traffic, particularly during the busy harvest season.

The author is the resident engineer; E. F. Nordlin is the Bridge Department representative on the project, and Henry Linkert is the contractor's general superintendent.

New Bay Crossing

Continued from page 6 . . .

investigation and study of the feasibility of financing and construction of the bridge, expenses of the authority in connection with the issuance and sale of bonds, and all other charges of whatsoever kind or character properly chargeable to the cost of constructing the bridge, and also for the payment of interest on the bonds during the construction of the bridge and for six months thereafter. An additional issue may be made by the authority, not to exceed $10,000,000, if necessary to complete the bridge or to finance the completion of the lower level of the structure, including surfacing and completion of such lower level, improvements to approaches and additional approach roadways, and additional toll collection facilities.

This greatly needed highway facility first conceived in the latter part of 1949, has moved forward with record speed and at the present time it is estimated to be 20 percent complete, with every indication that it will be completed and serving the traveling public by the date originally set, in October of 1956. The project is an outstanding example of the progress which can be accomplished by the cooperative efforts of governmental agencies at the city, county, and state levels, working together for a public improvement, needed by all.

CALIFORNIA STREET AND HIGHWAY CONFERENCE

The Sixth California Street and Highway Conference has been scheduled for February 3, 4, and 5, 1954, at the University of California at Los Angeles. Presented annually by the Institute of Transportation and Traffic Engineering, University of California (Berkeley and Los Angeles), the conference serves as a forum for road men from all levels of government and from the industry.

GOODWIN J. KNIGHT
Governor of California
FRANK B. DURKEE . . Director of Public Works

CALIFORNIA HIGHWAY COMMISSION
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Shores of Lake Mary in Mono County, reached by State Route 112, take on light mantle of white in preparation for winter's snows. Photo by Robert A. Munroe, Photographic Section

